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Bibliography on Wind Waves and Swell, p. 1300

Vol. 5 November 1954 No. 11

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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A. Current Abstracts in English on important meteorological literature in every language.

B. Bibliographic references to other items of interest to the profession.

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 5 NOVEMBER, 1954 No. 11

SPECIAL FEATURE IN THIS ISSUE

A Selective Annotated Bibliography on Wind Waves and Swell

(*For complete table of contents see back cover*)

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FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to ring to the attention of meteorologists current literature in their field and in related fields and o provide bibliographic information on various subjects, as interest demands.

Part I contains abstracts of current literature in the fields of meteorology, oceanography, tc., arranged according to the Universal Decimal Classification.

Part II of each issue comprises a special annotated bibliography of important references n a special subject. No attempt is made to prepare exhaustive bibliographies; instead, the im is to include a representative cross section of the various aspects of a subject.

Bibliographies published in the successive issues of Vol. 1, 1950 were:

) **Atmospheric Pollution,** 2) **Aerobiology,** 3) **Cloud Physics,** 4) **Hail,** 5) **Tornadoes,** 6) **Volcanic Dust,** 7) **Climatic Changes,** 8) **Thunderstorms,** 9) **Icing,** 10) **Acoustical Propagation** and 11) **Evaporation.**

Those published in Vol. II, 1951 were:

) **Extended Forecasting,** 2) **Long Range Forecasting,** 3) **Soil Temperature,** 4) **Constants, Tables, etc.,** 5) **Climate of Near East,** 6) **Climate of Middle East,** 7) **Special Winds,** 8) **Radar Storm Detection,** 9) **Condensation Trails,** 10) **Climate of Northeast Africa** and 11) **Mountain Meteorology.**

Other bibliographies previously published were:

No.	Mo.	Vol. III, 1952	Vol. IV, 1953
1.	Jan.	**Climate—Northwest Africa**	**Turbulence Theory**
2.	Feb.	**Carbon Dioxide**	**Turbulent Diffusion and Exchange**
3.	March	**Climate—Argentina, etc.**	**Frost and Frost Forecasting**
4.	April	**Dew**	**Climate of Australia and New Zealand**
5.	May	**Objective Forecasting**	**High Level Winds (500–100 mb)**
6.	June	**Stratus Forecasting**	**High Level Winds (above 100 mb)**
7.	July	**Urban Climatology**	**Jet Stream**
8.	Aug.	**Climate—Central Africa**	**Radiation Bioclimatology**
9.	Sept.	**Visibility**	**Climatology of the Pacific**
10.	Oct.	**Glaze and Rime**	**Auroras**
11.	Nov.	**Free Air Turbulence**	**Sferics**

Bibliographies published this year are:

1. **General Oceanographic Meteorology,** Vol. V, No. 1, Jan. 1954
2. **Climate of Southeast Asia and Netherlands Indies,** Vol. V, No. 2, Feb. 1954
3. **Physics of Auroras,** Vol. 5, No. 3, March 1954
4. **Tropopause,** Vol. 5, No. 4, April 1954
5. **Balloons,** Vol. 5, No. 5, May 1954
6. **Numerical Forecasting,** Vol. 5, No. 6, June 1954
7. **Radiation Data,** Vol. 5, No. 7, July 1954
8. **Vertical Motion,** Vol. 5, No. 8, Aug. 1954
9. **Climatology of the Arctic Basin,** Vol. 5, No. 9, Sept. 1954
10. **Industrial Meteorology,** Vol. 5, No. 10, Oct. 1954
11. **Wind Waves and Swell,** Vol. 5, No. 11, Nov. 1954

Forthcoming bibliography will be:

1. **Meteorological Bibliographies,** Vol. 6, No. 1, Jan. 1955

Other bibliographies in preparation are:

Actinometers
Arctic Synoptic Meteorology
Climate of the Arctic
Cosmic Rays in the Atmosphere
Fog Forecasting
Indoor Climatology
Microwave Propagation
Night Airglow
Ocean-Atmosphere Energy Exchange
Ozone
Singularities
Snow Cover
Synoptic Aerology
Tropical Cyclones

Part III contains a listing of the contents of those journals which are primarily meteorological. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. In the December issue cumulative author, subject, geographical and journal indexes are published.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where t material may be found. The Union List of Serials (Gregory) is the source of most of t symbols used. In some cases, where no symbol has been assigned to a library, one will devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DSG:	U. S. Army Medical Library, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory (and American Meteorologic Society) Library, Milton, Mass.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
!	before an entry indicates a synoptic case history study accompanied by char

Geographic locations are in the English form rather than the form used locally, for examp Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwi stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to t Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months a abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Numb (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (V 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

WORKS OF SPECIAL INTEREST

See also: **Climatic change: evidence, causes, and effects** (Shapley [*ed.*], 5.11–183.

5.11–1 551.58(410)

Brooks, C. E. P., **The English climate.** With a foreword by Sir David Brunt. London, English Universities Press, **1954.** 214 p. 27 figs., 6 tables, refs. Price: 12s/6d. **DWB**—"This book describes in simple terms the climate and weather of Britain as they affect the man in the street." Chs. 1–3 describe briefly the physical basis of British climate including the Gulf Stream, the prevailing winds and air masses, the structure of depressions with some historical examples including the storm of 1703, squalls and tornadoes. Ch. 4 deals with rain, snow and hail, with a chart of "raininess" (rainfall×no. of raindays). Ch. 5 is concerned mainly with the effects of atmospheric pollution, illustrated by a chart of "dirtiness" of London air. The next three chapters take up problems of local climate, climate and health, and "where to live, where to holiday." Chs. 9–13 discuss seasonal changes, "singularities" and historic extremes of weather, and Ch. 14 weather cycles and other prognostics. The final chapter gives an explanation of daily weather maps, televised charts and the Automobile Association's "Road weather chart." *Subject Headings:* **1. Climatology 2. Microclimatology 3. Bioclimatology 4. Great Britain. I. Brunt, Sir David.**—*C.E.P.B.*

5.11–2 551.5:551.46(02)

Hamburg. Deutsches Hydrographisches Institut, **Handbuch des Atlantischen Ozeans, Bd. 1, Nordatlantischer Ozean.** [Handbook of the Atlantic Oceans, Vol. 1, North Atlantic Ocean.] Completely rev. 4th ed. of **Dampferhandbuch für den Atlantischen Ozean** (1928). Hamburg, Pub. by the Institut, **1952.** 290 p. numerous diagrs. and charts (fold.) Its Nr. 1057. **DWB**—The first edition of this handbook for North Atlantic sea navigation was published in 1905 and the second in 1913. The 3rd ed. (1928) has been completely revised to include material on radar storm location (with illustrations from radar scope photos) and material more pertinent to motor ships than to the older steam or sailing vessels which were in vogue when the earlier editions were prepared. Of course charts of frequencies of fog, ice, storms, winds and hurricanes have appeared in most "sailing directions" since MAURY but air-sea temperature differences, frontal passages and their effects on navigation, refractive index, navigation in fog (radar and loran) are added features. *Subject Headings:* **1. Sailing directions 2. Marine meteorology 3. Marine climatology 4. North Atlantic Ocean.**—*M.R.*

5.11–3 551.594.7(08)

Israël, Hans (*Aachen*), **World symposium on spherics.** *Geofisica Pura e Applicata*, v. 25:223–224, **1953.** Text in German. **MH-BH**—An account of the meeting held in Zurich in March 17–25, 1953, of the CREM of the Commission of Aerology of the WMO. The meeting of the working group on Radio-Electric Meteorology (CREM) was attended by 25 delegates from 9 countries and by observers from URSI, ICAO and CCIR as well as the WMO. Matters taken up at the meeting were: Terminology, recorders, synchronization of stations, improved chart of world thunderstorm activity (C. E. P. BROOKS) and, finally, participations in the 3rd Polar Year or Geophysical Year (1957–58). *Subject Headings:* **1. Sferics symposium –1953 2. Sferics research 3. Zurich, Switzerland.**—*M.R.*

5.11–4 551.508(02)

†Kedrolivanskiĭ, V. N. and Sternzam, M. S., **Meteorologicheskie pribory.** [Meteorological instruments.] Leningrad, Gidromet. Izdat., **1953.** 544 p. 403+figs., 31+tables, bibliog. p. 496–500, 463 eqs., appends. **DWB**—An advanced textbook on meteorological

instruments and apparatus used specifically by the Hydrometeorological Service and b scientific research institutions, observatories and expeditions of the U.S.S.R. The boo attempts to give the theoretical and physical basis for an understanding of the operation an the results of such instruments, and is intended for students in universities and governmen training courses. The only books of equivalent competence are those of CLEVELAND ABB (1888), KLEINSCHMIDT (1935) (*see item* 5.11–34, Nov. 1954, *MAB*), and MIDDLETON an SPILHAUS (1953) (*see item* 5.10–6, Oct. 1954, *MAB*). The present text is based (at least 95% on Russian literature and equipment, although the general principles are universal. Th separate chapters cover measurements of: I. Temperature, II. Humidity, III. Evaporatio IV. Precipitation, V. Clouds, VI. Radiation (actinometry), VII. Pressure, VIII. Win IX. Atmospheric electricity, X. Visibility and illumination, XI. Complex conversion an reduction tables. A five page bibliography, arranged by chapters, is included. The speci instruments for aerological, oceanographic or hydrological observations are not covered in th text as those subjects are covered in detail in the recent texts of KALINOVSKIĬ and PINU (1951). Rather, the authors confine themselves to equipment for *surface* observation including such special apparatus as hot-wire anemometers, measurement of vertical velocitie dust or nuclei content of air, drop size and liquid water content of air, radiation balanc electrical charges, soil temperature and moisture measurements, etc. Hundreds of schemat diagrams and illustrations add to the value and interest of the volume. *Subject Heading* **1. Meteorological instruments 2. Textbooks.**—*M.R.*

5.11–5 551.58(0

Kostin, S. I. and Pokrovskaia, T. V., **Klimatologiia.** [Climatology.] Leningra Gidromet. Izdat., **1953.** 426 p. 146 figs., 74 tables, 19 refs., eqs. **DWB**—This new tex book on climatology, intended for those working in or intending to work in the hydrometeor logical Service of the U.S.S.R., is divided into 3 major parts. In Pt. I the basic concepts an methods of climatology, the climate of the earth and of the U.S.S.R. (in more detail) a treated from the point of view of the radiation, circulation and topographic or surface cov influences and their effects. Microclimate, climatic changes and artificial influences climate are also treated in this section. The second section is a unique presentation methods of collecting, compiling and interpretating climatic data and data for the separa elements (radiation, heat and moisture balance, temperature, pressure, wind, cloudine sunshine, precipitation, snow cover, soil temperature, and various other atmospheric ph nomena). Methods of charting droughts, effective moisture, climatic anomalies, synop climatological factors and "complex" climatology (of FEDOROV) are illustrated. A samp punch card (45 column) for marine observations is shown. Agroclimatological (includi phenological) methods are also described and illustrated. The latest statistical techniqu for handling meteorological data, including the use of more complex machines (80 colu cards), are presented. The climatic classification schemes of L. S. BERG and of B. P. ALIS and KÖPPEN are illustrated and discussed; the former at great length. *Subject Headin* **1. Climatology 2. Climatology of U.S.S.R. 3. Textbooks 4. U.S.S.R.**—*M.R.*

5.11–6 551.593(02) 535(0

Morgan, Joseph, **Introduction to geometrical and physical optics.** New York, McGra Hill Book Company, Inc., **1953.** 450 p. Price: $6.50. **DLC**—This new book covers num ous aspects of optics for intermediate studies. Reflection, refraction, lenses, photomet interference, diffraction, polarization, spectra, etc. are among the subjects covered in separ chapters. Each chapter has problems and answers and there is a very complete index. V bility, scattering, color of sky, and a few other atmospheric optical phenomena are trea briefly, but halos, coronas, mirages, etc. are not mentioned. A few references are given at end of some of the chapters. *Subject Headings:* **1. Optics 2. Atmospheric optics 3. Te books.**—*M.R.*

5.11–7 551.510.53:016 551.594.5:

†Resnick, Robert and Stein, Stanley, **The spectra and chemical kinetics of the up atmosphere. A literature survey.** Pittsburgh. Univ. Spectroscopy Laboratory, Contr AF 19(122)-478, Scientific Report, No. 1, Pts. 1–6, Oct. 31, **1952**–Aug. 10, **1953.** 6 pie

DWB—Contents: Pt. 1, Subject classification; Pts. 2–4, Author classification; Pt. 5, Subject classification (of supplementary material); Pt. 6, Author classification (of supplementary material). This voluminous literature survey covers in detail the recent scientific treatises on airglow; atmospheric composition; auroras; ionospheric spectra; spectra and chemical kinetics of atmospheric particles; lightning; luminous clouds; meteors; solar influences; atmospheric pressure, temperature and meteors above 30 km. and zodiacal light. A list of journals cited is appended to each part. Abstracts of varying lengths, taken mainly from *Physics Abstracts*, *Chemical Abstracts* and *Meteorological Abstracts and Bibliography*, are included with about ¾ of the citations in the author classification volumes (II, III, IV and VI). A list of abstractors is appended at the end of each of these volumes. At least 4000 items are included in the author and in the subject volumes. *Subject Headings:* **1. Auroral bibliographies 2. Upper atmosphere bibliographies 3. Bibliographies 4. Abstracts. I. Contract AF 19(122)-478 II. Pittsburgh Univ. Spectroscopy Laboratory.**—*M.R.*

5.11–8 551.515:525.63 550.342(08)

†Symposium on Microseisms, Harriman, N. Y., Sept. 4–6, 1952, [**Proceedings.**] Wash., D. C., National Academy of Sciences, National Research Council, Dec. **1953.** 125 p. diagrs., refs., eqs. Contents: Macelwane, J. B., **Sketch of the history of microseismology;** Ramirez, J. E., **Tripartite stations and direction of approach of microseisms;** Gilmore, Marion H., **Amplitude distribution of storm microseisms;** Båth, Markus, **Microseismic period spectra and related problems in the Scandinavian area;** Longuet-Higgins, M. S., **Can sea waves cause microseisms?;** Van Straten, F. W., **Storm and surf microseisms;** Press, Frank and Ewing, Maurice, **The ocean as an acoustic system;** Scholte, J. G., **On theories of the origin of microseisms. DWB**—The symposium, at which the above papers were read and discussed by various of the participants, was held with the aim of broadening the viewpoints of those working in the field, rather than converting the group to one point of view. The conflicting theories that have been advanced in the past 75 years are discussed in detail in several of the papers, and references to the literature are ample. It is agreed that the microseisms of 4–10 seconds are more common in winter than in summer, in seacoast regions than in continental, and that they are connected with meteorological (storm) activity. The medium of transmission from the atmosphere to the earth is usually considered to be through sea water, but the conflict arises as to whether it is through surf, standing waves in the center of storm areas, or some other mechanism. There is also disagreement as to the type of seismic wave motion that is involved. *Subject Headings:* **1. Microseisms 2. Microseism research. I. U. S. Office of Naval Research II. U. S. Air Force. Geophysical Research Directorate.**—*M.R.*

5.11–9 551.582(7)

§*†Vivitskiĭ, G. N., **Klimaty Severnoĭ Ameriki.** [Climates of North America.] Moscow, Gos. Izdat. Geogr. Lit., **1953.** 287 p. 55 figs., numerous tables, 291 refs. **DLC**—A synoptic as well as statistical review of the climate of the entire continent of North America, starting with Alaska and including Canada, Greenland, the United States, Mexico, Central America and the West Indies. The book is divided into three parts. Pt. I deals with the processes which influence the climate as a whole and during the winter, spring, summer and autumn, respectively, and the results of these influences on the climate as a whole. Pt. II takes up the Arctic, sub-Arctic, Temperate, sub-Tropical, Trade wind and Equatorial monsoon zones. Pt. III presents tables of the usual climatic elements for 264 stations or a selection thereof, in some cases. The book represents a systematic and creative review and integration of all the generally available literature on North America or parts thereof as shown in the extensive bibliography. The illustrations, including numerous cross sections and synoptic charts, are well chosen to illustrate given situations which are described. *Subject Headings:* **1. Climate North America 2. Climatic data 3. Synoptic climatology 4. Bibliographies 5. North America.**—*M.R.*

GENERAL METEOROLOGY

See also: **North Atlantic Ocean** (Hamburg. Deutsches Hydrographisches Inst.), 5.11–2.

5.11–10 551.

Australia. Commonwealth Scientific and Industrial Research Organization. Sectio of Meteorological Physics, **Annual Report, 1952/1953.** 11 p. List of publications of the staf p. 11. Mimeo. **DWB**—An ambitious program of meteorological research which has bee conducted in Australia during the last year or so by the Section of Meteorological Physics the CSIRO is outlined in some detail. Specific investigations on the general circulatio climatic or circulation trends and anomalies, dynamic climatology, convective aspects cloud physics, micrometeorology, turbulence and instrumentation for small scale meteor logical studies, frost prevention by fans, radio meteorology, (tropospheric, tropopause an ionospheric reflection), ozone, sea surface temperature and evaporation are reviewed. *Subje Headings:* **1. Meteorological research 2. Australia.**—*M.R.*

5.11–11 551

†Bilancini, Raoul, **L'attività meteorologica italiana nel triennio 1948–1950.** [Italia activity in meteorology during 1948–1950.] *Rivista di Meteorologia Aeronautica*, Rom 13(2/3):52–61, April/Sept. **1953.** 113 refs. Italian, French, English and German summari p. 52. **MH-BH**—A long list of the publications of Italian meteorologists reporting on resear during the 3 years (1948–50) in various branches of meteorology, with citations to articles the bibliography (dynamics, synoptics, local meteorology, clouds, condensation nuclei, aerolog atmospheric optics, radiation, instruments and methods, applied meteorology, climatology Research in progress is also summarized and an excellent bibliography included. *Subj Headings:* **1. Meteorological research 2. Progress in meteorology 3. Meteorological bib ographies 4. Italy.**—*M.R.*

5.11–12 551.5(058)(43

Germany. Deutscher Wetterdienst. Meteorologisches Amt für Nordwestdeutschlan **Bericht über die Tätigkeit im Jahre 1952.** [Report on activity in 1952.] Hamburg, 19 26 p. 3 plates. **DLC**—This report follows the usual lines of reports on the various sectio of the central office at Hamburg, aviation weather service, and sub-offices. A list of pub cations by the Staff is included. *Subject Headings:* **1. Annual meteorological reports Meteorological services 3. Northwest Germany.**—*C.E.P.B.*

5.11–13 551.5

Petrović, R., **Zasedanje Proširenog kolegijuma Savezne uprave hidrometeorolo službe.** [Meeting of the General Assembly of the Federal Directorate of the Yugosl Hydrometeorological Service.] *Yugoslavia. Hidrometeorološka Služba, Vesnik*, 1(5):89– Nov./Dec. **1952. DWB**—Report on the activity of the Yugoslav Hydrometeorological Serv during 1952. Progress in hydrological, meteorological and climatological observation, search, publication and forecasting is outlined. Instruments constructed in the Servic workshop are specified. The report mentions visits of UN technical experts BERGERON a KOHLER. *Subject Headings:* **1. Meteorological conferences 2. Meteorological servic 3. Yugoslav Hydrometeorological Service 4. Yugoslavia.**—*G.T.*

5.11–14 55:06 551.5

Rendiconti della Prima Assemblea Generale della Societa Italiana di Geofisica e M teorologia, Genova, 10–12 Aprile, 1953. [Transactions of the First General Assembly of Meteorological Society, Genoa, April 10–12, 1953.] *Geofisica e Meteorologia*, Genoa, 1(2/ 47–56, March/June **1953. DWB**—Brief note on the Assembly and abstracts or summar of 21 papers read by geophysicists and meteorologists from Italy, France, Germany, Belgiu Austria and Switzerland. Most of the papers will be published in *Geofisica e Meteorolo* or in *Geofisica Pura e Applicata*. The subject matter ranges from seismic explosion wav radar used in oceanography, numerical forecasting, (analog) calculators, eclipse studies of

nosphere, geophysical prospecting, polarization of light and solar radiation during an eclipse snow cover and hail shooting. *Subject Headings:* **1. Conventions 2. Italian Meteorological ociety 3. Geophysical conferences 4. Meteorological conferences.**—*M.R.*

5.11–15 551.5:06

U. S. Dept. of Commerce. Advisory Committee on Weather Services, **Weather is the ation's business. 1953.** 59 p. **DLC.** An abridged version of this original report of the ommittee under the direction of J. J. GEORGE, is to be found in *American Meteorological ociety, Bulletin*, 35(1):1–13, Jan. **1954. MH-BH**—The organization and procedures of the ommittee are first outlined. Functions of the Weather Service as established by law and ecommended changes in the law are next considered. Budget and fiscal problems, economies hat can be effected, improvements which are suggested for instrumentation, observations, imatological and forecasting services, analysis centers, communications, research and develop- ient, personnel and training, publications and, finally, relations with private meteorology re outlined. *Subject Headings:* **1. Meteorological services 2. Weather service improvement. George, J. J. II. U. S. Weather Bureau.**—*M.R.*

5.11–16 551.5:061.1(44)(09)

France. Météorologie Nationale, **Ce qu'est la météorologie française.** [What is rench meteorology?] Paris, Météorologie Nationale, **1952.** 30 p. 21 figs. **DWB**— n extensive, illustrated description of the history of and present organization of the rench meteorological service, including the overseas or colonial service. Among the con- ributions of the French were the suggestion for a synoptic network by LAVOISIER (1781) nd realized in France in 1856, forecasts (1863), the discovery of the stratosphere by TEIS- ERENC DE BORT (1898), the radiosonde by Bureau (1927) and the first stationary weather ip, the "Carimaré" (1937). Many important international conventions held in France are so listed. *Subject Headings:* **1. History of meteorology 2. Meteorological services France. Météorologie Nationale.**—*M.R.*

5.11–17 551.5:061.3(234.3)

Schlegel, Max, **Alpen-meteorologische Tagung in Obergurgl (Ötztal, Tirol).** [Alpine eteorological meeting in Obergurgl (Ötztal, Tirol).] *Meteorologische Rundschau*, 5(9/10): 84–185, Sept./Oct. **1952. DWB.** Also: **Il Secondo Convegno Internazionale di Meteorologia lpina, Obergurgl (Innsbruck), 20–22 Settembre 1952.** [The Second International Meeting Alpine Meteorology, Obergurgl (Innsbruck), Sept. 20–22, 1952.] *Geofisica e Meteorologia*, enoa, 1(1):14, Jan./Feb. **1953. DWB.** Also: **Bericht über die zweite internationale Tagung ir alpine Meteorologie in Obergurgl, Österreich, am 20. and 21. Sept. 1952.** [Report on the econd International Conference on Alpine Meteorology in Obergurgl, Austria, Sept. 20 and 21, 952.] *Wetter und Leben*, 5(1/2):1–54, March **1953.** figs., tables, refs. **MH-BH**—Con- rence was attended by 130 students from 6 countries. Papers read are listed in the article *Met. Rund.* and abstracts of the papers appear in *Wetter und Leben. Subject Headings:* **. Meteorological conferences 2. International Conference on Alpine Meteorology, Sept. 0–21, 1952 3. Mountain meteorology.**

5.11–18 551.5:37(02)

†Voigts, Heinrich, **Die Meteorologie in den Physik- und Erdkundelehrbüchern für die öheren Schulen.** [Meteorology in the physics and geography textbooks for higher schools.] *Meteorologische Rundschau*, 7(5/6):103–108, May/June **1954.** table, 39 refs. **DWB**—Also is: **Die Wetter- und Klimakunde im Lehrplan der Physik und Erdkunde für die höheren chulen.** [Teaching of weather and climate in the syllabus of physics and geography for igher schools.] *Ibid.*, 7(9/10):186–188, Sept./Oct. **1954.** table, 2 refs. Both articles tabu- te and discuss information on meteorology and climatology in a large number of German extbooks. Continuation of articles in *Met. Rund.*, 5(3/4):59–63 and 5(5/6):107–108, 1952. *See items* 3.11–24, Nov. 1952 and 5.7–24, July 1954, *MAB.*) *Subject Heading:* **1. Teaching of eteorology.**—*C.E.P.B.*

5.11–19 551.5:5

Schmauss, A., **Biologische Gedanken in der Meteorologie.** [Biological ideas in m teorology.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 6(1/2):3–6, 19 3 refs. **DWB**—Author develops the analogy between biology and meteorology. Biology never simple; every organism has its own peculiarities and many of the conditions are unknov or uncontrollable so that it is necessary to work with departures from the standard. Similar in meteorology; every new discovery merely increases the number of variable factors in t weather. *Subject Heading:* **1. Biological methods in meteorology.**—*C.E.P.B.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Estimation of cloud parameters by radar** (Atlas), 5.11–152; **Law of growth in statistical studies** (Schneider-Carius), 5.11–159.

5.11–20 551.501:551.577.37:551.31

Hartke, Wolfgang, **Kartierung von Starkregenzügen auf Grund ihrer bodenzerstörend Wirkung.** [Charting heavy rain tracks by their erosive effect.] *Erdkunde*, 8(3):202–20 **1954.** 4 figs., 6 refs. English summary p. 202. **DLC**—Heavy rains cause soil erosion a author considers that this may be a useful aid to plotting rainfall streaks where raingages a few. In Rhine-Main area a streak has a mean width of 7–10 km. Two cases, April 25 a May 17, 1949, are plotted, assuming storm totals of 20–40 mm cause slight—moderate erosi 40–60 mm severe and above 60 mm very severe erosion. The synoptic situations are discusse *Subject Headings:* **1. Rainstorms 2. Rainstorm charting 3. Soil erosion.**—*C.E.P.B.*

5.11–21 551.501.1:551.508.71(

Walden, Hans, **Zur Feuchtigkeitsmessung in älteren Thermometerhütten auf Schiff** [On humidity measurements in old thermometer screens on ships.] *Annalen der Meteorolog* 6(3/4):124–125, **1953/54.** fig. **MH-BH**—Mean diurnal variation of difference between d bulb and wet bulb temperature on windward side of ship and in screen are plotted from 1 observations in Jan.–June 1952. The mean difference ranges from −0.3°C at night to o +2°C in afternoon. *Subject Headings:* **1. Humidity measurement 2. Marine meteorologi observation.**—*C.E.P.B.*

5.11–22 551.501.45:519.

Essenwanger, O., **Probleme der Häufigkeitsanalyse.** [Problems of frequency analys *Meteorologische Rundschau*, 7(5/6):85–88, May/June **1954.** 4 figs., 10 refs. **DWB**—M and standard deviation may give a false idea of a climatic frequency distribution. Examp are given of normal, Poisson, U-shaped (cloud amount) and skew (pressure) frequency curv In some cases, e.g. visibility, curve can be normalized by using logarithmic steps. Oth can be dealt with as sum of two to four normal curves. As examples, frequency of daily ra fall is analyzed. Thus rainfall at Bremen July–Sept. is fitted by a curve made up of 3 nor curves on a log scale. *Subject Headings:* **1. Methods of computation 2. Statistical analysis** *C.E.P.B.*

5.11–23 551.501.45:551.511:551.

Gifford, Frank, Jr. (*U. S. W. B., Wash., D. C.*), **An alignment chart for atmosph diffusion calculation.** *American Meteorological Society, Bulletin*, 34(3):101–105, March 1 3 figs., 2 tables, 6 refs., 13 eqs. Also: **Addendum to. . . .** *Ibid.*, 34(5):216, May **1953. M BH**—An alignment chart is presented by means of which nine of the most common equat on atmospheric diffusion, formulas due to SUTTON, or any formulas comparable with th may be quickly evaluated. In the addendum a table accidentally omitted from the orig article is given. *Subject Headings:* **1. Nomograms 2. Atmospheric diffusion calculatio** *Author's abstract.*

5.11–24 551.501.6:551.509.52

Rai Sircar, N. C. (*Reg. Met. Center, Bombay*), **On the use of tephigrams for forecasting nor'westers.** *Indian Journal of Meteorology and Geophysics*, 4(4):269–278, Oct. **1953.** 8 figs., 5 refs. **MH-BH**—Special afternoon radiosonde ascents made at Calcutta on May 21, 26 and 30, 1951 showed that the 0830 (local time) radiosondes do not give a reliable indication of the thermodynamic structure of the atmosphere and the resulting occurrence or non-occurrence of northwesters in the afternoon or evening. Each case is discussed in detail and the tephigrams for successive soundings compared to show the marked modifications which occur during the course of the day. In order to properly predict such squalls it is necessary to consider advective changes in upper air temperature as indicated by stations to the west on the synoptic charts. *Subject Headings:* **1. Tephigram analysis 2. Thunderstorm forecasting 3. Northwesters 4. Bay of Bengal 5. Calcutta, India.**—*M.R.*

5.11–25 551.501.81:551.576.11

Battan, Louis J., **Duration of convective radar clouds.** *American Meteorological Society, Bulletin*, 34(5):277–228, May **1953. DWB**—The duration of individual convective cells was studied on the basis of a group of individual echoes whose development and complete history could be followed. The data were taken from photographs of PPI scopes of a high powered S-band search radar set in southwestern Ohio used by the Thunderstorm Project. Frequency distribution of the duration of the echo and time required for it to reach maximum size for different maximum sizes of radar clouds are given in tables. For echoes smaller than 3 inches the duration increases with size. The maximum duration of radar cells was between 40 and 45 minutes. The mean time required for an echo to attain maximum size is 10 minutes and the mode 8 minutes. *Subject Headings:* **1. Convective clouds 2. Radar echoes from clouds.**—*I.L.D.*

5.11–26 551.501.81:551.574.1:551.576.11

†Browne, I. C.; Palmer, H. P. and Wormell, T. W., **The physics of rainclouds.** *Royal Meteorological Society, Quarterly Journal*, 80(345):291–327, July **1954.** 10 figs., 135 refs., eqs. **DWB**—This authoritative review opens with a statement of the problems and a summary of observations of temperature of cloud summits, radar data, results of cloud seeding experiments and rain from non-freezing clouds. Authors then turn to physical properties of precipitation elements, including terminal velocities of raindrops and hailstones, collection efficiencies of falling raindrops, coalescence, fragmentation of drops and splintering of ice crystals. The nature and concentration of condensation and freezing nuclei are discussed, leading to theory and observation of processes of condensation, evaporation and sublimation. Sec. 4 deals with the depth, extent, updraft, turbulence, humidity, liquid water content and droplet size, first of layer clouds and then of convective rainclouds and cumulonimbus cells. Sec. 5 discusses cloud budgets and formulates models of a cloud in a steady state and a convective raincloud, including initiation and growth of precipitation elements. Sec. 6 goes into the physics and results of radar cloud studies, with a schematic diagram of echo intensity from various levels. The review ends with a list of four unsolved problems, a comprehensive list of references, and a collection of useful constants. *Subject Heading:* **1. Cloud physics.**—*C.E.P.B.*

5.11–27 551.501.81:551.515.3

Long, Allen, **Radar spies on tornadoes.** *Science News Letter*, 65(7):106–107, Feb. 13, **1954.** fig. **DWB**—Description of Texas tornado warning network consisting of 16 rehabilitated radar sets that were outmoded for U. S. Weather Bureau aerological work. When severe storms are predicted for an area, the radars will be put into operation. Then when suspicious looking clouds appear in the radar screen the Weather Bureau will make long distance telephone calls to determine the exact nature of the storm and from then on the tornado cloud (if it occurs) will be tracked by radar and surface observations, with due warning given to areas on its immediate path. *Subject Headings:* **1. Tornado warning networks 2. Radar tornado detection 3. Texas.**—*M.R.*

OBSERVATIONAL DATA

5.11–28 551.506(669

*Ibadan, Nigeria. University College. Dept. of Geography, **Climatic observations a University College, Ibadan,** No. 1, June/Dec. **1952;** latest issue recd. No. 5, Feb./May **1954** chiefly tables. Mimeo. **CU**(1–), **DWB** (2–). Also: **Supplement to Climatic observation at University College,** No. 3, June/Sept. **1953;** latest issue recd. No. 4, Oct. **1952**/Jan. **1954** about 20 p. each. entirely tables. **DWB**—Air temperatures (dry and wet bulb) four time a day and maximum and minimum temperatures read at 10 h daily; precipitation, sunshine cloudiness, relative humidity; soil temperature at depths of 2, 4, 12, 24 and 48 in. and gras minimum temperature, wind direction, cloudiness, dew, precipitation, evaporation given fo each day or for 07, 10, 16 and 18 h readings each day are tabulated by months for Ibadan Nigeria. The Supplement contains daily observations or precipitation and evaporation (fo each of 4 different tanks) for each month for University College, Ibadan. Computed an measured evapotranspiration and maximum and minimum temperature, relative humidit and precipitation are also given for each day and for the month for Moor Plantation, Ibadan Tropical Testing Station, Port Harcourt; Agricultural Research Station at Samaru and a Daura; and the Veterinary Research Station, Vom. *Subject Headings:* **1. Observational dat 2. Monthly climatic data 3. Ibadan, Nigeria 4. Nigeria.**—*M.R.*

5.11–29 551.506.1(67

*French Equatorial Africa. Service Météorologique, **Recueil de moyennes climatologique** [Summary of climatological means.] July **1953.** 10 p. entirely tables. Note in introd This pamphlet is intended to replace, temporarily, the exhausted 1946 edition of its *Annal Climatologiques*. Mimeo. **DWB**—Average monthly precipitation, number of days wit precipitation, mean relative humidity, mean and absolute monthly maxima and minima, an coordinates of >200 stations in the 4 areas of French Equatorial Africa are presented (Cabo Moyen-Congo, Ubangi-shari and Chad). *Subject Headings:* **1. Monthly climatic repor 2. French Equatorial Africa.**—*M.R.*

5.11–30 551.506.1:551.577.2(431/

*Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologisch Dienst, **Deutsches Meteorologisches Jahrbuch, 1952, Teil 3, Niederschlagsbeobachtunge** [German Meteorological yearbook, 1952, Part 3, Rainfall observations.] pub. 1953. 206 mostly tables, charts in pocket. **DWB**—Daily precipitation amounts for each month of 19 are tabulated for >700 stations (about half of the network) in East Germany. Snow dept water content of snow, extremes and durations of snow and rain are also tabulated. Leng of record, station location, region, etc. designated for the entire 1400 stations in the networ Loose charts show areas of precipitation within certain class limits and departures from norm for each month of 1952. (*See* 3.5–47, May 1952, *MAB* for 1950 yearbook.) *Subject Heading* **1. Observational data 2. Precipitation data 3. Snowfall data 4. Yearbooks 5. Ea Germany.**—*M.R.*

INSTRUMENT CARRIERS

See also: **Atmos. ozone measurem. from rockets** (Van Allen), 5.11–65; **Fog conditions of the Lower Elbe** (Hartenstein, Markgraf), 5.11–149.

5.11–31 551.507.

Artificial moonlet now. *Science News Letter*, 65(13):197, March 27, **1954.** illus. **DW** —S. F. SINGER, of the Univ. of Maryland, urges launching a 50 pound experimental satell to revolve around the earth in 2 hours at a height of 200 miles and persisting for about 3 weel It is now possible to produce such a missile at a reasonable cost. The unmanned "plane would be useful to make observations on cosmic and solar radiation in all bands from X-ra and UV to radio waves above the effective atmosphere, to learn secrets of the aurora and observe or photograph weather conditions on the earth beneath. The "MOUSE" (minimu orbital, unmanned satellite earth) would not have a radio transmitter but would have to la

before records could be evaluated. *Subject Headings:* **1. Earth satellites 2. Artificial planets 3. Ionospheric research 4. "MOUSE" observations. I. Singer, S. F.**—*M.R.*

5.11–32 551.507.3

Craig, Richard A. and Haig, Thomas O. (*eds.*), **Results of controlled-altitude balloon flights at 50,000 to 70,000 feet during September 1952.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 30, Feb. **1953.** 223 p. tables, diagrs., charts (some fold.). **DWB**—Details on flights S-29 through S-43 "Moby Dick." Data for each flight are presented in five sections: (A) General information on balloon, package, inflation, launching and flight; (B) altitude calibration (conversion of code letters into pressure-altitude); (C) data transmitted (time, call letters of receiving station, bearing and class of bearing, code letters for altitude, probable position, code letters for ballast expenditure); (D) altitude and ballast expenditure graphs and (E) trajectory map. *Subject Headings:* **1. Balloon performance 2. Balloon trajectories 3. Constant level balloons.**—*G.T.*

5.11–33 551.507.321

Mapleson, W. W., **The drag of spherical rubber balloons.** *Royal Meteorological Society, Quarterly Journal*, 80(345):449–451, July **1954.** 3 refs. **DWB**—Drag coefficient C_d on a moored balloon was determined in 3 experiments. Mean was about $2.7\times10^5R^{-1}$ but it increased as shape of balloon deviated from spherical. This may explain variation in rate of ascent of balloons. *Subject Heading:* **1. Balloons.**—*C.E.P.B.*

INSTRUMENTS

See also: **Meteorological instruments** (Kedrolivanskiĭ, Sternzam), 5.11–4; **Humidity measurements** (Walden), 5.11–21.

5.11–34 551.508(02)

†Kleinschmidt, Ernst (*ed.*), **Handbuch der meteorologischen Instrumente und ihrer Auswirkung;** bearbeitet von Fritz Albrecht, Paul Duckert, W. Grundmann, Johannes Grunow, Chr. Jensen, K. Kähler, Ernst Kleinschmidt, Walter Kopp, W. Kühl, Josef Reger, Max Robitzsch, Reinhard Süring. [Handbook of meteorological instruments and their use. . . .] Berlin, Julius Springer, **1935.** 733 p. photos, graphs, diagrs., refs., bibliogs. **DLC**—The most comprehensive, intensive and detailed treatment of all types of instruments, used for measuring any meteorological phenomenon from the earliest days down to the middle of the 1930's. The earlier forms of radiosonde (Duckert and Molchanov) and the determination of upper air winds by means of goniometric (direction finder) observations on radiosonde balloons are among the latest developments mentioned. The work is a compendium of articles by authorities in each of the following fields: thermometry, humidity and hygrometry, barometry, anemometry, aerology, measurement of evaporation, atmospheric pollution, cloud physics, precipitation, cloud amount, height and movement, atmospheric electricity, visibility, optics and acoustics, etc. Numerous tables are given for calculating and reduction of many quantities. Hundreds of diagrams, photographs of instruments and equipment in detail and operation, and of references to original sources make this a practical handbook for any approach one might wish to make to the problem of instrument construction, calibration or use. Samples or records and working charts or diagrams are also indexed. Theoretical consideration in all of these fields, as well as minute details of construction are given *in extenso*, mathematically and schematically. An eleven page table of contents and twelve page, triple column subject index give an idea of the amazing detail with which the work is treated. *Subject Headings:* **1. Meteorological instruments 2. Instrument calibration 3. Computation tables 4. Handbooks.**—*M.R.*

5.11–35 551.508.21

Schulze, Rudolf, **Optische Durchlässigkeit von Lupolen-H für Ultraviolett-Strahlung, sichtbares Licht und Infrarot-Strahlung.** [Optical transmission of polyethylene-H for ultraviolet, visible and infrared radiation.] *Annalen der Meteorologie*, 6(3/4):127–128, **1953/54.**

fig., 4 refs. **MH-BH**—The optical transparency of this material, suitable for wind shields for radiation recorders, is shown for wave-lengths 0.3–50μ. *Subject Heading:* **1. Actinometry.**—*C.E.P.B.*

5.11–36 551.508.21

Suomi, V. E.; Franssila, Matti and Islitzer, Norman F., **An improved net-radiation instrument.** *Journal of Meteorology*, 11(4):276–282, Aug. **1954.** 7 figs., 9 refs. **DWB**—The theory and construction of an instrument sensitive to all wave-lengths 0.17–80μ are described. Wind effect is compensated by a ventilation jet. The instrument measures the net flux of radiation through a horizontal surface with an accuracy of 2%. *Subject Heading:* **1. Radiation balance meters.**—*C.E.P.B.*

5.11–37 551.508.25:551.521.61

Jancke, Hans, **Infrarot-Spektroskopie, ihre Methoden und Aufgaben.** [Infrared-spectroscopy, its methods and tasks.] *Akademie der Wissenschaften zu Berlin, Wissenschaftliche Annalen*, 2(2):113–123, Feb. **1953.** 2 figs., diagrs. **DLC**—A systematic review on infrared radiation and its measurement from its discovery in 1800 up to the modern methods of chemical analysis by means of infrared spectra. *Subject Heading:* **1. Infrared spectroscopy**—*A.A.*

5.11–38 551.508.25:551.521.61

Schulze, Rudolf, **Über ein Strahlungsmessgerät mit ultrarotdurchlässiger Windschutzhaube am Meteorologischen Observatorium Hamburg.** [A radiation measuring instrument with a windshield which is transparent to infrared located at the Hamburg Meteorological Observatory.] *Geofisica Pura e Applicata*, 24:107–114, Jan./April **1953.** 7 figs., 6 refs. English summary p. 107. **DWB**—A complicated radiation measuring apparatus, consisting of two Moll thermopiles facing upward and downward, respectively, and protected from the wind by a weather resistant Lupolen-H filter highly transparent in the infrared region is described. Transmissivity curves are shown for the shield (.1 mm thick). Records made graphically by connections with 3 galvanometers showing sky and sun, earth and difference between sky and earth radiations are reproduced and compared with those for a Moll-Gorczyński type solarimeter under conditions of snow at the ground. The data permit calculation of the mean radiant temperature of the atmosphere and the earth, and the balance of radiation in a wide spectral band. Nocturnal radiation can also be calculated. *Subject Headings:* **1. Radiation instruments 2. Infrared radiation measurement.**—*M.R.*

5.11–39 551.508.3

Olbers, W., **Welche Forderungen stellt der Meteorologe an ein Windmess- und Windregistriergerät?** [What requirements has a meteorologist for a wind measuring and wind recording apparatus?] *Germany. Deutscher Wetterdienst. Zentralamt für Nordwestdeutschland, Technische Mitteilungen der Instrumentenabteilung*, No. 22:14–19, Jan. **1953.** 25 refs. **DWB**—A survey of requirements for wind measurement, including direct registration of the wind speed in the first, second and third power, the logarithmic registration of wind gustiness, etc. Another apparatus gives directly the frequency of certain wind speeds. The most rational method is to measure the mean speed in 10-minute intervals, as well as the maximum gustiness speeds. *Subject Headings:* **1. Wind measurement 2. Wind instruments**—*A.A.*

5.11–40 551.508.53/54:629.1

Brewer, Given, **Calibrating the PBY-6A airplane for meteorological purposes.** *Aeronautical Engineering Review*, N. Y., 13(2):24–28, Feb. **1954.** 7 figs., 7 refs. **DWB**—Tests were conducted during the period from Sept. 1952 to March 1953 to determine accuracy of integrating accelerometers, differentiating altimeters, strain gages and oscillographs installed in PBY-6A Navy airplanes for measuring velocities, frequency and character of gusts. Examples of oscillogram traces of altimeter and accelerometer records and plot of light and drag coefficients under varying circumstances are presented. Methods of mounting and details of equipment are described. The altimeter records almost coincide with accelerometer record

though it lags somewhat behind the latter. *Subject Headings:* **1. Gust measurement equipment 2. Gust loads 3. Airplane instrumentation 4. Accelerometer calibration.**—*M.R.*

5.11–41 551.508.54:681.14

Collins, B. G., **An instrument for recording the frequency distribution of mean hourly wind speeds.** *Meteorological Magazine*, London, 83(986):232–234, Aug. **1954.** 2 figs., photo, 2 refs. **DWB**—A setup is described, with circuit diagram, for use in ventilation research. It is built mainly of standard components for use with a contact cup anemometer and records on dials the numbers of hours (separately in three 8-hour periods per day) with 0.5, 1, 2 . . . 31–50 mph. (ten intervals in all) and total wind run. Examples of cumulative percentage frequencies for design purposes are shown. *Subject Heading:* **1. Wind meters.**—*C.E.P.B.*

5.11–42 551.508.54:551.551

Gill, Gerald C. (*Round Hill Field Station, M.I.T.*), **A fast response anemometer for micrometeorological investigations.** *American Meteorological Society, Bulletin*, 35(2):69–75, Feb. **1954.** Also in: M.I.T. Round Hill Field Station, Contract AF 19(604)-145, Scientific Report, No. 2, May 1, **1953.** 5 figs., 2 tables, 20 refs. **MH-BH**—There has been relatively little study of the fine structure of turbulent flow near the ground due, in no small part, to the scarcity of suitable instrumentation to measure and record the rapid fluctuations of the wind. The present paper describes a simple heated-thermocouple type of hot-wire anemometer that in a wind averaging 5 m sec^{-1} is capable of recording sinusoidal wind fluctuations of 10 per sec with an accuracy of better than 90%, and of 40 per sec with an accuracy of 50%. *Subject Headings:* **1. Hot wire anemometers 2. Micrometeorological turbulence 3. Wind fluctuations. I. Massachusetts Institute of Technology. Round Hill Field Station II. Contract AF 19(604)-145.**—*Author's abstract.*

5.11–43 551.508.54

Trollund A. E. (*Dir., Met. Office, Santiago, Chile*), **A simple mechanism to improve the sensitivity of a Dines anemograph.** *Royal Meteorological Society, Quarterly Journal*, 80(345): 447–449, July **1954.** 4 figs. **DWB**—Sluggishness which developed in a Dines anemograph in Chile was eliminated by supporting the rod joining float to pen in ball bearings. *Subject Heading:* **1. Dines anemograph.**—*C.E.P.B.*

5.11–44 551.508.71

Smith, Walter J. and Hofflich, Nancy J. (*Arthur D. Little, Inc., Cambridge, Mass.*), **The carbon film electric hygrometer element.** *American Meteorological Society, Bulletin*, 35(2):60–62, Feb. **1954.** 3 figs. **MH-BH**—A new type of electric hygrometer, the "carbon film element," is described. Its response to humidity changes is by electronic rather than electrolytic conduction. Main features of the new element are: high sensitivity to moisture changes, rapid response, absence of polarization effect, and a calibration independent of temperature between 0° and 40°C. Components of the carbon film, performance data and manufacturing techniques are described. *Subject Heading:* **1. Electric hygrometers.**—*Authors' abstract.*

5.11–45 551.508.74 632.9:633.491

Wallin, J. R. and Polhemus, Dale N. (*U. S. Dept. of Agr., Ames, Iowa*), **A dew recorder.** *Science*, 119(3087):294–295, Feb. 26, **1954.** **DWB**—For studying late blight disease of potato and tomato, a simple dew recorder was developed by the authors. It operates on the principle that a strip of lamb gut, attached to a pen arm will when wet with dew, draw the pen toward the record sheet (on a rotating cylinder) and will relax so the pen falls away from the chart when the dew dries up. The trace thus left on the record sheet indicates the duration of dew. It begins tracing within 5 minutes after dew appears and stops within 5 min. after disappearance of visible dew from surrounding foliage. *Subject Headings:* **1. Dew recorders 2. Potato blight.**—*M.R.*

5.11–46 551.508.77

Kopp, Walter, **Der Regenbildschreiber.** [The rain picture plotter.] *Meteorologische Rundschau*, 7(5/6):102–103, May/June **1954.** 4 figs. **DWB**—Shows an improved form of

instrument described in *Germany. Deutscher Wetterdienst in der U. S. Zone, Berichte*, No. 12, 1950 (*see item* 9–26, Sept. 1950, *MAB*) and No. 35, 1952 (*see item* 4.1–191, Jan. 1953, *MAB*). It includes an adjustable clock (rotation 3–12 hrs), circular dye-impregnated recording paper on a rotating carrier, and a cover with a slit protected from spray. Specimen records are shown and applications suggested. *Subject Heading:* **Rainfall recorders.**—*C.E.P.B.*

5.11–47 551.508.91:551.574.1

*Bider, M. and Verzár, F., **Kontinuierliche Messung atmosphärischer Kondensationskerne (Vorläufige Ergebnisse mit dem registrierenden Kernzähler in Basel.)** [Continuous measurement of atmospheric condensation nuclei. (Preliminary results with the recording nuclei counter in Basel).] *Geofisica Pura e Applicata*, 26:127–140, **1953.** 10 figs., 3 tables, 14 refs. In German; German and English summaries p. 127. **DWB**—Hourly averages of condensation nuclei count at Basel taken from continuous records made with a Verzár photoelectric counter using the Pollak (1946–1952) principle, during Jan.–March 1953 are analyzed to show relation to time of day (maximum at 10 h–16 h), wind speed (slight decrease with increase in wind speed), wind direction (maximum from NNW–ENE, minimum from SW), cloudiness (most on clear days), relative humidity (decrease with increase in R.H.) visibility (relation obscure) and air mass types (max. in MT, min. in MP). *Subject Headings:* **1. Condensation nuclei recording instruments 2. Condensation nuclei variations.**—*M.R.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Use of tephigrams for forecasting nor'westers** (Rai Sircar), 5.11–24; **Estimating snow melt from air temperature . . .** (U.S.W.B.), 5.11–173; **Temperature conditions in Central Europe** (Burger), 5.11–204.

5.11–48 551.509.3

Sutcliffe, R. C., **Predictability in meteorology.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:3–15, **1954.** English, German and French summaries p. 3–5. **MH-BH**—"There is a hierarchy of meteorological systems and sub-systems from the whole atmosphere down to micro-meteorological systems. A definite prediction of the behaviour of a system is possible only if the system exists and is observable in sufficient detail. This effectively limits the period of prediction on any scale to a time during which unborn or unobservable systems on that scale are not important. . . . This provides in general four types of practicable forecasts: 1) for a period of order 1 hour, definite for sub-synoptic systems (e.g. showers); 2) for a period of order 1 day, definite for small synoptic systems and including statistical-probability effects of sub-synoptic systems; 3) for a period of a few days, definite for large synoptic systems and including statistical-probability effects of the smaller scale systems and 4) more extended forecasts, depending on the discovery of regularities in the fluctuating behaviour of the whole atmospheric system." *Subject Heading:* **1. Weather forecasting.**—(*From author's abstract.*)

5.11–49 551.509.31

Bushby, F. H. and Hinds, Mavis K., **The electronic computation of two series of 500 mb–1000 mb., and 500–1000 mb. thickness forecast charts by application of the Sawyer-Bushby 2 parameter baroclinic model.** *Great Britain, Meteorological Research Committee, M.R.P.* No. 841, Dec. 31, **1953.** 8 p. 10 figs., 2 tables, 7 refs., 7 eqs. Mimeo. **GB-MO.** Also **A preliminary report on ten computed sets of forecasts based on the Sawyer and Bushby two-parameter atmospheric model.** *Ibid.*, No. 863, May 26, **1954.** 7 p. 10 figs., table, 2 refs., 3 eqs. Mimeo. **GB-MO**—The Sawyer-Bushby model of the atmosphere is set out in a form suitable for machine computation of the height and thickness of pressure levels. The technique of computation is described and the results of two trials are shown in numerous charts. They gave a fair representation of the motion of the real atmosphere for a 24 hr period. In the second paper ten 12-hr and 24-hr forecasts of 500 and 1000 mb contours and 1000–500 mb thickness over N. Atlantic and W. Europe were computed on the Sawyer-Bushby model using 1 hr steps. Machine time was 8½ min/step. Actual and forecast charts are

shown and each case is discussed and compared with conventional forecasts. Correlation coefficients between actual and forecast 24-hr changes are tabulated. Correlation is good; on the whole the conventional forecasts showed up better but this was mainly due to neglect of heating of cold air over Atlantic in winter, overestimation of contour heights in anticyclones, and small area of grid. *Subject Headings:* **1. Numerical forecasting 2. Electronic computers.** —*C.E.P.B.*

5.11–50 551.509.312

Platzman, G. W., **The computational stability of boundary conditions in numerical integration of the vorticity equation.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:29–40, **1954.** 5 figs., 2 refs., 21 eqs. English, German and French summaries p. 29. **MH-BH**—In forecasting large-scale flow patterns by numerical integration of the vorticity equation over a limited area, errors are introduced by the assumed boundary conditions and penetrate inwards during the iteration process. Three cases of boundary conditions which have been used at Princeton are examined. It is shown that the degree of computational instability depends on the initial assumptions as to boundary vorticity. *Subject Heading:* **1. Numerical forecasting.**—*C.E.P.B.*

5.11–51 551.509.312 551.573

Sutton, O. G., **The development of meteorology as an exact science.** *Royal Meteorological Society, Quarterly Journal*, 80(345):328–338, July **1954.** 6 refs. Also in: *Nature*, London, 173(4415):1112–1114, June 12, **1954. DWB**—An exact science is defined as one in which it is possible to make observations of high precision, and in which the solutions of certain mathematical problems correspond closely to numbers indicated by measurement. This is only loosely true of meteorology. Mathematical problems discussed are: evaporation as a problem of diffusion from a semi-infinite area, or of energy balance; and the mathematics of synoptic forecasting. Earlier "models" and the use of periodicities are dismissed briefly; the main hope lies in direct attack by the equations of hydrodynamics to indicate the most probable line of development of a synoptic situation. This is illustrated by an account of the Sawyer-Bushby model atmosphere. *Subject Headings:* **1. Numerical forecasting 2. Evaporation.**—*C.E.P.B.*

5.11–52 551.509.33

Baur, F., **Die Bestätigung bisheriger Ergebnisse der Grosswetterforschung durch den Winter 1953/54.** [Confirmation of former results of broad-weather investigation during the winter 1953/54.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:188–198, **1954.** fig., 3 tables, 7 refs. German, English and French summaries p. 188. **MH-BH**—The severe winter of 1953–54 in central Europe followed a dry late summer and a dry warm fall. Rainfall in Germany was deficient in each month Aug. to Nov. preceding each of 12 earlier cold winters, a significant result. The large temperature fall in Oct.–Nov. in W. Siberia, and the pressure distribution in Nov. over Europe, were other indications of a cold winter. The fact that Dec. 1953 was mild was due to a temporary pressure distribution; the winter as a whole was cold. *Subject Heading:* **1. Long range forecasting.**—*C.E.P.B.*

5.11–53 551.509.33:551.524.37

Rodewald, Martin, **Die barische Vorbereitung des Europa-Winters 1954.** [The baric preparation of the European winter of 1954.] *Annalen der Meteorologie*, 6(3/4):94–109, **1953/54.** 15 figs., 30 refs. German and English summaries p. 94. **MH-BH**—After a general discussion of possibilities of monthly forecasts by movements of pressure centers, the character of winter 1953–54 is examined in relation to various forecasting "rules." Author remarks that these made both a cold and a mild winter highly probable! Anomalies of Northern Hemisphere circulation in 1950–53 are plotted, showing progressive movement of centers of high and low pressure, and especially drift of a pressure excess in the first quarter from S. W. Atlantic to Germany. The month to month pressure changes in Sept. to Dec. 1953 are then plotted; the Nov.–Dec. rise N.W. of Britain closely resembles that preceding 5 earlier cold winters. These eastward movements continued in Dec. 1953–Jan. 1954 and Jan.–Feb. 1954 and favored

the establishment of a cold winter circulation. *Subject Headings:* **1. Long range forecasting 2. Severe winters 3. Europe.**—*C.E.P.B.*

5.11–54 551.509.5:551.515.4

Forst, Albert L. (*Short Range Fore. Dv. Sec., U. S. Weather Bureau*), **Remarks on "On thunderstorm forecasting in the central United States."** *Monthly Weather Review*, 81(2):40–42, Feb. **1953.** fig., table. **DWB**—A test of the thunderstorm forecasting technique devised by MEANS (*see item* 4.9–52, Sept. 1954, *MAB*) has been conducted, using 920 forecasts for 10 stations in the Mississippi Valley. The results are tabulated in 4 groups, yielding verification ranging from 51% (Omaha) to 78% (Dayton) as compared to 60% for Omaha and 78% for Dayton when using Showalter's stability index. A chart of stability vs. moisture for Chicago for the same season (reproduced as Fig. 1) allows a no-thunderstorm forecast to be made for a group of cases lying on the high side of the 40% line of Means' method, yet having only 18% incidence of thunderstorms. *Subject Headings:* **1. Thunderstorm forecasting 2. Objective forecasting 3. Stability-moisture index. I. Means, Lynn L. II. Showalter, A.**—*M.R.*

5.11–55 551.509.5:551.515.2

Riehl, Herbert and Haggard, William H., **Prediction of tropical cyclone tracks.** U. S. Bureau of Aeronautics (Navy), Project AROWA (TED-UNL-MA-501.12), Research Report Dec. **1953.** 32 p. 12 figs., tables, 7 refs. **DWB**—The prediction of tropical cyclone tracks is investigated in terms of flow patterns at the 500-mb level. Techniques for predicting the zonal meridional components of motion 24 hours in advance are developed. The zonal component of motion is computed from the geostrophic relation applied to 500-mb height differences on a grid moving with the cyclone center. The meridional component is computed on another portion of this same moving grid. The application of the techniques is demonstrated; results of application to the 1953 Atlantic storm season, and examples of the prediction techniques are included. *Subject Headings:* **1. Tropical cyclone track forecasting 2. Zonal component of motion. I. Project AROWA (TED-UNL-MA-501.12) II. U. S. Bureau of Aeronautics (Navy).**—*Authors' abstract.*

5.11–56 551.509.5

Spar, Jerome (*Dept. of Met. & Oceanog., New York Univ.*), **A suggested technique for quantitative precipitation forecasting.** *Monthly Weather Review*, 81(8):217–221, Aug. **1953.** 5 figs., 5 refs., 11 eqs. **MH-BH**—The theory and computation of integrated water vapor transport vectors are described and it is shown how the synoptic analysis of these vectors may be used for quantitative precipitation forecasting. An example of the vector field and the precipitation forecast is given. Although the prognostic formula does not give correct point values of the precipitation, reasonably good agreement is found between the distributions of forecast and observed precipitation. The technique is probably too laborious for daily forecasting routine but it may be useful in the evaluation of rainmaking experiments. *Subject Headings:* **1. Precipitation forecasting 2. Forecasting techniques 3. Cloud seeding evaluation.**—*Author's abstract.*

5.11–57 551.509.

Thompson, J. C. and Collins, G. O., **A generalized study of precipitation forecasting Part I: Computation of precipitation from the fields of moisture and wind.** *Monthly Weather Review*, 81(4):91–100, April **1953.** 3 figs., 5 tables. 13 refs. **MH-BH**—For the eventual purpose of developing a generalized method for predicting precipitation from assumed accurate prognoses of the required meteorological elements, a preliminary investigation is made of the contemporary relationship between precipitation and the fields of moisture and wind in the atmosphere. Procedures are developed for calculating the rate of precipitation by computing the divergence of the horizontal wind at 50-mb intervals from the surface to 300 mb using a technique suggested by BELLAMY. From these values, vertical speeds are determined. Using the vertical speeds in Fulks' formula for the rate of precipitation from pseudo-adiabatic ascending air, but with some modifications to compensate for non-saturated initial conditions, a method is derived for calculating the intensity of precipitation. Computed amounts are compared with observed precipitation. *Subject Headings:* **1. Precipitation forecasting 2. Forecasting techniques.**—*Authors' abstract.*

CLOUD SEEDING AND ARTIFICIAL PRECIPITATION

5.11–58 551.509.67

Davies, D. A., **Experiments on artificial stimulation of rain in East Africa.** *Nature*, London, 174(4423):256–258, Aug. 7, **1954.** 7 refs. **DWB**—In continuation of earlier experiments, finely ground salt carried by balloons was successfully exploded in cu cloud on 64 occasions. Of these, no rain fell on 17 (cloud often dispersed), very light rain fell but did not reach ground on 10, light rain on 30, moderate on 3 and heavy on 4. The lag between inoculation and rain was 7–35 min, average about 24 min in good agreement with 22 min expected on Bowen's theory. *Subject Headings:* **1. Cloud seeding 2. East Africa.**—*C.E.P.B.*

5.11–59 551.509.67:551.577.3(85)

Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Evaluation of cloud seeding in the Chicama-Moche region of Peru, for the period Sept. 1951–June 1953.** Dec. **1953.** 30 p. 4 tables, 19 figs., 12 maps. **DWB**—The first report (*see item* 4.11–85, Nov. 1953, *MAB*) gives results of operations of first season from Sept. 1951 to June 1952. The present report gives results from July 1952 to June 1953 and an exhaustive analysis of results of both seasons. The AgI generators were set up on the ground at points near the Continental Divide. Rainfall 30% greater than expected (1 chance in 1000) is claimed for months with 25 hours or more of generator operation, while during months with no seeding a 7% increase (insignificant) occurred. Runoff was 24% more and 10% less than expected in the same respective periods. *Subject Headings:* **1. Cloud seeding evaluation 2. Cloud seeding with silver iodide 3. Chicama-Moche Region, Peru.**—*M.R.*

5.11–60 551.509.67:551.577.3(714)

Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Evaluation of cloud seeding operations in the Lake St. John Watershed for the Aluminum Company of Canada, Ltd.** March **1953.** 44 p. numerous charts (fold.). **DWB**—See previous report for 1951 (*item* 3.10–89, Oct. 1952, *MAB*). Cloud seeding trials in Lake St. John, Quebec area from Aug. 9–Oct. 3, 1952 increased precipitation in that area by 15% or an additional 0.94″ of rain in 8 weeks over 7,000 sq. mi. area in target area "A" (northern portion); and 23% or .64″ during 6 weeks from Oct. 29–Dec. 8, 1952 over 20,000 sq. mi. in area B (southern portion of Watershed). All told, 45 billion cubic ft. of water were squeezed out of the clouds by Howell in that area. About 180 rainfall stations are used on isohyetal charts and in the evaluation. Weather conditions and seeding operations are described and evaluated for each day when seeding occurred. *Subject Headings:* **1. Cloud seeding evaluation 2. Isohyetal charts 3. Lake St. John Watershed, Quebec.**—*M.R.*

5.11–61 551.509.67:551.577.3(714)

Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Evaluation of the cloud seeding operations in the St. Maurice River Watershed for the Shawinigan Water and Power Company, Nov. 11–Dec. 12, 1952.** April **1953.** 14 p. map, numerous charts (fold.). **DWB**—See previous report for 1951 (*item* 3.10–89, Oct. 1952, *MAB*). Silver iodide cloud seeding operations carried out in Quebec (north of St. Lawrence River) during Nov. and Dec. 1952 proved successful, as this report shows. Between Nov. 11 and Dec. 12, 1952 precipitation was increased by 12%, or a 0.46″ increase over 5,100 sq. mi., yielding 5 billion cu ft of water, all told. Each situation when seeding occurred is described synoptically and accompanied by charts showing precipitation which occurred within target area, using data for about 180 precipitation stations (list appended). *Subject Headings:* **1. Cloud seeding evaluation 2. Isohyetal charts 3. St. Maurice River Watershed, Quebec.**—*M.R.*

5.11–62 551.509.67:551.579(747)

*Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Runoff evaluation of cloud seeding in the watersheds of the Stillwater Reservoir and of the Bennett's Bridge (Salmon River) Reservoir conducted during 1951 and 1952.** Nov. **1953.** 8 p. 3 figs., table. **DWB**—Attempts at rainfall stimulation made in the watersheds of the Niagara-Mohawk Power Co. in Sept. and Nov. 1951 proved unsuccessful and attempts made from June-Nov. 1952 yielded 32% more runoff than would be expected if relationship between control and target watersheds

were directly proportional. Analysis of rainfall records proved that relation is not directly proportional, so a re-evaluation gave evidence of runoff increased by 53% over expected amount with reliability of 3 in one thousand. The Cranberry Lake and Hinckley watersheds were used as control areas. *Subject Headings:* **1. Cloud seeding evaluation 2. Runoff evaluation 3. Northeastern New York (State).**—*M.R.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

UPPER ATMOSPHERE—IONOSPHERE

See also: **Spectra and chemical kinetics of the upper atmosphere** (Resknick, Stein), 5.11–7; **Variation of temp. in the lower stratosphere** (Bannon), 5.11–112; **Oscillations of the stratosphere** (Johnson), 5.11–134; **Ground- and zero-layer of the atmosphere** (Schneider-Carius, Faust), 5.11–136.

5.11–63 551.510.534:551.524.

Momin, A. U., **Spectroscopic measurement of the diurnal variation of the effective ozonosphere temperature.** *Current Science*, Bangalore, 23(5):143–144, May **1954.** 2 figs., 6 refs. **DWB**—A method is described for determining ozonosphere temperature by comparing the emission of a thermocouple detector in an infrared spectroscope at 9.6μ with the emission of the atmospheric ozone layer at the same wavelength. Measurements made by applying this method are reported from Poona, India (18°30′N, 73°51′E) for May, Oct., and Nov., 1953. As a result of the measurements, a curve showing the diurnal variation of ozonosphere temperature is presented. *Subject Headings:* **1. Ozonosphere temperature variations 2. Poona India.**—*G.T.*

5.11–64 551.510.534:551.55

Paetzold, H. K., **Ozonschicht und Luftbewegungen in der Stratosphäre.** [Ozone layer and air movements in the stratosphere.] *Naturwissenschaften*, 41(14):318–322, July **1954.** 3 figs., 19 refs. **DLC**—Vertical distribution of ozone concentration at Weissenau shows marked variations. Primary maximum is always near 23 km. Secondary maximum near 16 km only occurs when air at 11–16 km comes from north, and is absent in fall and winter in agreement with annual variation at 20 km in polar regions. A third peak at 6 km is probably also advective. Ratio ozone/air is constant near 20 km showing that vertical movements vanish at that height. Above that is a vertical oscillation with amplitude at least 10 km. Annual variation of ozone at different heights is set out and analyzed into photochemical and advective factors and vertical transport. *Subject Headings:* **1. Ozone layer 2. Stratosphere winds.**—*C.E.P.B.*

5.11–65 551.510.534:551.507.36

Van Allen, J. A. and Hopfield, J. J. (*Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.*), **Preliminary report on atmospheric ozone measurements from rockets.** *Société Royale des Sciences de Liège, Mémoires, Ser. 4*, 12(1/2):179–183, **1952.** fig. **DLC**—Rocket (aerobee) borne ozone spectrometer is illustrated diagrammatically and results of flight of Jan. 25, 1951 at White Sands, N. Mex., using a quartz spectrograph, shown for 5 km height intervals from 25 to 60 km. (0.061 cm at 25 and 0.000054 cm at 60 km). *Subject Headings:* **1. Ozone distribution in upper atmosphere 2. Rocket instrumentation 3. Quartz spectrographs.**—*M.R.*

5.11–66 551.510.535:523.7

Appleton, Edward and Piggott, W. R., **Ionospheric absorption measurements during a sunspot cycle.** *Journal of Atmospheric and Terrestrial Physics*, 5(3):141–172, July **1954.** 16 figs., 3 tables, 26 refs., 38 eqs. **DWB**—The results of measurements of absorption of radio waves in ionospheric reflection, made in S.E. England 1935–1953, are examined. $|\log \rho|$ (ρ = effective reflection coefficient) is related to radio wave frequency f, solar zenith distance χ and sunspot number R. Variation with f is accounted for by magneto-ionic theory. $|\log \rho|$ is proportional to $(\cos \chi)^{0.75}$ instead of $(\cos \chi)^{1.5}$ as simple theory predicts, but with occasio

of excessive absorption on winter days associated with sporadic reflection below E layer. There is a direct relation with R, especially in summer. The absorbing layer is believed to be within D layer. It is probable that sudden ionospheric disturbances associated with solar flares are due to ionization increased 5–10 times in the normal absorbing layer (level of D layer) but D layer does not contribute substantially to diurnal magnetic variations. *Subject Headings:* **1. Ionospheric variations 2. Sunspot effects.**—*C.E.P.B.*

5.11–67 551.510.535:621.396

Argence, Émile, **Solution analytique approchée du problème de Poeverlein.** [Approximate analytic solution of a Poeverlein problem.] *Société Royale des Sciences de Liège, Mémoires, Ser. 4*, 12(1/2):253–267, **1952.** 5 figs., 8 refs., eqs. **DLC**—Theoretical study of the trajectories of an electromagnetic (radio) signal in an ionized medium under the influence of the earth's magnetic field. The trajectories of normal and oblique incidence rays in the plane of the magnetic meridian are calculated, neglecting variations in magnetic inclination. The study shows that rays are deflected in opposite direction at different heights; reflection occurring at lower altitude for extra-ordinary rays and deviation differing markedly in the case of "ordinary" rays. Thus ionospheric soundings can give information on the ionization in various layers of the ionosphere. *Subject Headings:* **1. Ionospheric sounding 2. Ionospheric radio wave propagation.**—*M.R.*

5.11–68 551.510.535

Burkard, O., **Studie zur Schichtaufspaltung in der Ionosphäre.** [Studies of layer splitting in the ionosphere.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:283–291, **1954.** 4 figs., 6 refs., 17 eqs. German, English and French summaries p. 283–284. **MH-BH**—Assuming equilibrium of ionization, an equation of condition is derived which must be satisfied to give one or more maxima of electron concentration, given the temperature and recombination coefficient. It is shown that with constant temperature, splitting of F layer is very improbable. The splitting into F1 and F2 could be reasonably explained by a layer of warm air within the F layer, the recombination coefficient being assumed proportional to square of temperature. *Subject Heading:* **1. F layers.**—*C.E.P.B.*

5.11–69 551.510.535

Chapman, Sydney, **Winds in the ionosphere.** *Physics Today*, 7(7):8–12, July **1954.** illus. (on front cov.) **DLC**—In summing up the forces governing atmospheric motion, the author discusses: a) dynamic influences affecting all regions of the atmosphere, such as heat transmission, tidal effects and rotational deflection and b) dynamic influences varying with level, such as surface topography, horizontal oceanic transfer of heat, energy storage in the oceans, latent heat, energy of dissociation, ionization and excitation, transformation of stored energy, heat conduction, absorption and emission of radiation, friction and turbulence, external impact, electrostatic and electromagnetic influences, dynamo action in the ionosphere, turbulence and electromagnetism and dynamic action by external magnetic fields. Finally, the author touches on the problem of the influence of lower atmospheric processes on ionospheric motion, especially the half tidal, half thermal solar semidiurnal oscillation of the atmosphere and the lunar tidal motion of air at low and ionospheric levels. *Subject Headings:* **1. Dynamics of the atmosphere 2. Ionospheric winds.**—*G.T.*

5.11–70 551.510.535:523.78

Delobeau, Francis, **L'éclipse de soleil du 25–2–1952 à Gao.** [Solar eclipse of Feb. 25, 1952 at Gao.] *Annales de Géophysique*, 9(4):317–324, Oct./Dec. **1953.** 9 figs., 6 refs. French and English summaries p. 317. **MH-BH**—Discussion of ionospheric observations made every 10 minutes on film at Gao, French Sudan before the eclipse and continuously during the solar eclipse of Feb. 25, 1952. The eclipse was only partial there, but the E and F2 ionization was below normal, especially at 7:35 a.m. when the sunspot on the west side of the sun was hidden by the moon. The same records were made at Dakar. Some density recombination values and other ionospheric parameters are shown quantitatively for the anomalous period. *Subject Headings:* **1. Ionospheric anomalies 2. Eclipse effects 3. Solar eclipse, Feb. 1952 4. Gao, French Sudan.**—*M.R.*

5.11–71 551.510.53

Kelso, John M., **Group height calculations in the presence of the earth's magnetic field** *Journal of Atmospheric and Terrestrial Physics*, 5(3):117–131, July **1954.** 5 figs., 5 tables 8 refs., 37 eqs. Also in: Pennsylvania. State College. Ionosphere Research Laboratory Contract AF 19(122)-44, Scientific Report, No. 58, March 1, **1954.** 31 p. 5 tables, 8 refs. 37 eqs. **DWB**—A method is given for the computation of an $h'-f$ curve for an ionosphere o arbitrary shape. The effects of the earth's magnetic field may be included. The method i based on integral formulas involving the derivative of height with electron density, dz/dN, an this misbehavior of this derivative curve leads to inaccuracies in the results. The two integra formulas used are obtained as special cases of the Gauss-Christoffel quadrature formula. Th procedure is applied to: 1) a linear layer, 2) a parabolic layer, 3) a cosine layer and 4) an arc cosine layer. The first three cases are studied with and without the earth's magnetic field and the results of the first two are compared with exact calculations by other workers. Th cosine layer results are compared with those for a Chapman layer. The arc-cosine laye shows a maximum in the $h'-f$ curve which does not correspond to any prominent feature c the electron density curve, showing a need for care in the study of $h'-f$ curves. A differen method is given for the calculation of an $h'-f$ curve in the case of penetration of a layer c arbitrary shape. *Subject Heading:* **1. Ionospheric research.**—*Author's abstract.*

5.11–72 551.510.535:523.7

Mériau, P. and Rawer, K., **Observations ionosphériques durant l'éclipse du 25 févrie 1952 effectuées à Djibouti (Somalie).** [Ionospheric observations at Djibouti (Somaliland during the eclipse of Feb. 25, 1952.] *Annales de Géophysique*, 10(1):9–18, Jan./March **1954** 6 figs., 8 refs., eqs. French and English summaries p. 9. **MH-BH**—Since the critical fre quency appeared before the maximum of the eclipse, the usual interpretation process could nc be applied, especially to the observations on the F1 layer. It is concluded that the ionizin radiation was not evenly distributed over the solar disk. This is all the more likely considerin that discontinuities appeared in the variation of the f_0F1. The F1 layer was marked muc more during the eclipse than it usually does. Ionospheric absorption was under the influenc of the eclipse and decreased noticeably. *Subject Headings:* **1. Ionospheric observation 2. F1 layer 3. Ionospheric absorption 4. Solar eclipse effects 5. Solar eclipse, Feb. 195 6. Djibouti, French Somaliland.**—*Authors' abstract.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Atmos. diffusion calculation** (Gifford), 5.11–23; **General Circulation Project (M.I.T.),** 5.11–84.

5.11–73 551.511:551.558.1:536

†Batchelor, G. K., **Heat convection and buoyancy effects in fluids.** *Royal Meteorologica Society, Quarterly Journal*, 80(345):339–358, July **1954.** 6 figs., 22 refs., eqs. **DWB**—Th general form of the equations of transfer of heat and momentum in free convection are set ou and Prandtl, Rayleigh and Nusselt numbers are defined; the last is important in turbule flow. Author then discusses problems of free convection due to discrete (point or line) sourc (maintained or momentary) at a horizontal boundary in laminar and turbulent flow, an clouds and plumes appreciably lighter than the ambient fluid. Sec. 3 discusses free convectio due to a source uniformly distributed over a surface for (1) two horizontal boundaries different temperatures, a complex subject in which there is much recent research; (2) sem infinite fluid above a heated horizontal boundary and (3) in the presence of a forced win The lecture describes much experimental work by the authors referred to. *Subject Heading* **1. Convection 2. Heat transfer.**—*C.E.P.B.*

5.11–74 551.511:551.576.

Bewsey, C. G. F., **Some features of the diurnal variation of convection.** *Weather*, 9(7 203–205, July **1954.** ref. **MH-BH**—With westerly winds and unstable polar air, massi cumulus develops in summer over land on either side of English Channel. About midda cumulus over the sea dissipates rapidly. In winter showers are light in the afternoon b

become heavy and often thundery at night. The cause is the diurnal variation of temperature difference between land and sea. *Subject Headings:* **1. Convective activity 2. Cumulus clouds.** —*C.E.P.B.*

5.11–75 551.511:526.8

Ellison, T. H., **A note on the use of the stereographic map projection in dynamical meteorology.** *Royal Meteorological Society, Quarterly Journal,* 80(345):435–438, July **1954.** fig., table, 6 refs., 19 eqs. **DWB**—The equations of motion in curvilinear coordinates, in which the curvature of the earth is taken into account, are shown to be quite simple when the coordinate system is a particular one, closely related to the stereographic map projection. As an illustration of the use of these coordinates, derivations are given of the vorticity equation and of Ertel's theorem. *Subject Heading:* **1. Projections for meteorological charts.**—*Author's abstract.*

5.11–76 551.511

Frankenberger, E., **Ergebnisse von Wärmehaushaltmessungen.** [Results of heat balance measurements.] *Meteorologische Rundschau,* 7(5/6):81–85, May/June **1954.** 6 figs., 2 tables, 5 refs., 15 eqs. **DWB**—Components of heat exchange at ground surface: radiation exchange S = heat exchange B with subsurface + heat exchange L with air + V condensation —evaporation, are evaluated for a meadow at Quickborn. S was measured by recording effective radiation, B from temperatures at 0 and 40 cm depth. Temperature and humidity profiles were from wireless mast and V from a lysimeter. Mean hourly values, 6–19 h, of each are plotted and errors discussed. Mean incoming and outgoing heat due to each factor are tabulated for Quickborn and Potsdam. *Subject Heading:* **1. Heat exchange.**—*C.E.P.B.*

5.11–77 551.511:531.75

Gossard, Earl and Munk, Walter, **On gravity waves in the atmosphere.** *Journal of Meteorology,* 11(4):259–269, Aug. **1954.** 13 figs., 2 tables, 8 refs., 16 eqs. **DWB**—Records of microvariations of pressure, wind direction and speed at La Jolla, California, April 1952–May 1953, showed on 7 days oscillations of period 5–15 minutes, range 0.14–0.86 mb, 1–6.4 m/s and 78–318°. They occurred in light winds with a temperature inversion of 6–20°C at a few hundred meters. Pressure maxima coincide with maximum "orbital" (deviation) wind. Analysis indicates that oscillations are due to propagating waves of length 4–10 km with phase velocity about 10 m/s, crests normal to wind shear. At times they were correlated with variations of sea level. The observations are consistent with the theory of internal waves trapped in a shallow layer. *Subject Heading:* **1. Gravity waves.**—*C.E.P.B.*

5.11–78 551.511

†Lettau, Heinz, **A study of the mass, momentum and energy budget of the atmosphere.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* 7:133–157, **1954.** 8 figs., 2 charts, 73 refs. English, German and French summaries p. 133–134. **MH-BH**—Author reviews available data on the atmospheric budget. He begins with the transformations of radiant energy, fundamental and dynamic energy in the atmosphere, the last including eddy motion. The hydrologic cycle and the CO_2 cycle are next discussed; the latter is unbalanced, owing to a gradual increase. Meridional profiles are constructed for annual means of transfer of water (evaporation minus precipitation), relative momentum between earth and atmosphere, and sensible heat, and for mean velocity at 700 mb, ground drag and dissipation of kinetic energy. The mean "holdings" of precipitable water, angular momentum and sensible heat in the whole atmosphere in each latitude are compared with rate of dissipation, mainly by precipitation, ground drag and long wave radiation. It is computed that to annul the holdings, in the absence of renewal, would require for momentum 1–2 days, water 10 days and heat 100 days. *Subject Headings:* **1. Energy balance 2. Mechanics of the atmosphere.**—*C.E.P.B.*

5.11–79 551.511

Montgomery, R. B., **Convection of heat.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* 7:125–132, **1954.** 13 refs., 16 eqs. English, German and French sum-

maries p. 125–126. **MH-BH**—The formal statement of convective flow of heat in terms of density and enthalpy is not uniquely determined by the distributions of velocity, composition and temperature. The case of a fluid of uniform composition is first considered; the eddy flux of heat is expressed as a definite convective flow of enthalpy. The effect of a variable content of water vapor is next considered and, finally, that of non-uniform geopotential. In the last case it is considered that heat flux includes both enthalpy and potential energy (kinetic energy being neglected). *Subject Headings:* **1. Convection 2. Heat transfer.**—*C.E.P.B.*

5.11–80 551.511

Nyberg, Alf., **Meridional heat transport on a part of the Northern Hemisphere in November 1947, July 1949 and February 1950.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:99–113, **1954.** 6 figs., 4 tables, 13 refs. English, German and French summaries p. 99–100. **MH-BH**—The mean horizontal fluxes of enthalpy and latent heat were computed for each month for 40–70°N for levels up to 100 mb. They are 3–4 times greater in Nov. and Feb. than in July, and greatest at 850 mb. The large-scale eddy conductivity for enthalpy increases with horizontal meridional temperature gradient. Mean heating of the air column rises to about 1°C/day in 60–70°N but is less further north; this is attributed to mean sinking of polar air by 100 m/day. No relation was found between flux and circulation indexes. *Subject Heading:* **1. Heat exchange.**—*C.E.P.B.*

5.11–81 551.511:551.513

Palmén, E., **On the relationship between meridional eddy transfer of angular momentum and meridional circulations in the earth's atmosphere.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:80–84, **1954.** 9 refs., 5 eqs. English, German and French summaries p. 80–81. **MH-BH**—The poleward flux of angular momentum from the frictional layer in the trade wind across 30°N in the upper atmosphere is accounted for by a mean meridional circulation between 0° and 30°N. The mass transport is computed from data on poleward eddy flux of angular momentum (Y. Mintz, 1951) in Jan. 1949. The excess of precipitation over evaporation in the equatorial ascending branch of the circulation is calculated as 2–4 mm/day, a reasonable value. *Subject Headings:* **1. Meridional exchange 2. Momentum transfer.**—*C.E.P.B.*

5.11–82 551.511:551.51

Sheppard, P. A., **The vertical transfer of momentum in the general circulation.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:114–124, **1954.** fig., 4 tables, 8 refs. eqs. English, German and French summaries p. 114–115. **MH-BH**—A simple diagram of the general circulation and associated fluxes of zonal momentum is discussed and supported by observations. Over N.E. Atlantic friction layer in the westerlies is suppressed by a downward flux of momentum. In the trades an upward flux near the surface is reversed at moderate levels (above wind maximum). Values of eddy viscosity over oceans up to a few hundred meters are calculated. Vertical flux of momentum is extrapolated to middle and upper troposphere. It is concluded that in the lower troposphere transfer of momentum is probably mainly by convection above the layer of mechanical turbulence. *Subject Headings:* **1. Momentum transfer 2. Eddy viscosity.**—*C.E.P.B.*

5.11–83 551.51

Van Mieghem, J., **La forme rotationelle des équations de la dynamique atmosphérique et les invariants du mouvement de l'air.** [The rotational form of the equations of atmospheric dynamics and the invariants of air motion.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:16–28, **1954.** 9 refs., 19 eqs. French, German and English summaries p. 16–17. **MH-BH**—The equations of atmospheric motion are set out in general coordinates and the fundamental equation of absolute vorticity established. Different forms of this equation are discussed and a number of theorems deduced. Examples are given. *Subject Heading:* **1. Dynamics of the atmosphere.**—*C.E.P.B.*

GENERAL CIRCULATION

See also: **Relationships between meridional eddy and meridional circulation** (Palmen), 5.11–81; **Vertical transfer of momentum in the general circulation** (Sheppard), 5.11–82; **Study of blocking in Northern Hemisphere** (Sumner), 5.11–97.

5.11–84 551.513:551.511

Massachusetts Institute of Technology, **General Circulation Project.** Contract AF 19(122)-153, Reports, No. 6–8, Feb. 28, **1951.** May 31, **1951,** Aug. 31, **1951.** three pieces. 38+15+16 p. figs., tables, refs., eqs. **DWB**—In Report No. 6, Lorenz, Edward N., **Computation of the balance of angular momentum and the poleward transport of heat,** the balance of angular momentum is computed for the period Nov. 1, 1945 to Feb. 28, 1946 for various parts of the N. Hemisphere and an integrated diagram presented showing results for 20°–70°N and S latitudes to 7.5 km height. The transport of sensible heat across latitudes is also computed for the same period. In Report No. 7, Starr, Victor P., **A hemispherical study of the atmospheric angular momentum balance,** an attempt is made to determine the meridional eddy transport of angular momentum for the N. Hemisphere in the vicinity of 30°N from upper wind observations for a period of 6 months. The somewhat different methods of evaluation give essentially comparable results and indicate the presence of eddy transports which are ample to compensate for frictional losses of angular momentum farther north. No indications of the presence of a mean meridional circulation of the strength and character needed to produce a sensible northward transport of angular momentum are found. In Report No. 8, Starr, Victor P., **Note on the seasonal variation of the meridional flux of angular momentum,** data from 19 stations from Feb. 1949 to Jan. 1950 inclusive were used to calculate the meridional flux of angular momentum in different levels in the vicinity of 30°N. A marked seasonal variation was found. The angular momentum was about twice as great during the winter as during the summer. *Subject Headings:* **1. Atmospheric circulation 2. Angular momentum balance 3. Heat transport 4. Eddy flux. I. Contract AF 19(122)-153.**—*M.R., A.A.*

5.11–85 551.513.1

†Flohn, H. and Trenkle, H., **Zur Kenntnis des atmosphärischen Meridionalaustausches.** [On the knowledge of the atmospheric meridional exchange.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* 7:85–98, **1954.** 2 figs., 6 tables, 29 refs. German, English and French summaries p. 85. **MH-BH**—Various measures of the atmospheric circulation are discussed. As a rough measure, the meridional exchange along 55°N was calculated for each day Dec. 1948–Nov. 1951. The characteristics of Z (zonal+mixed, high index) and M (meridional+blocked, low index) types are tabulated. Frequencies of Z and M for whole circle and European half in 50–60°N are tabulated for each European type of general weather situation. It is concluded that Europe may be representative for troposphere zonal circulation but not for meridional. In *Z,* but not in M, type circulation index decreases with increasing number of long (Rossby) waves at 500 mb. Some relations are found with inclinations of axes of long waves. *Subject Heading:* **1. Meridional exchange.**—*C.E.P.B.*

5.11–86 551.513.1

Starr, Victor P. and Lorenz, Edward, **Application of the angular momentum principle to cyclones.** Massachusetts Institute of Technology, Contract AF 19(122)-153, Scientific Report, No. 5, Dec. 31, **1952.** 20 p. fig., refs., 20 eqs. **DWB**—The angular momentum equation for a cyclonic disturbance is examined. It is found that the increase of this momentum in a given region during the onset of an extratropical cyclone is due mainly to a flux of such momentum into the region from the environment. A synoptic example is included. *Subject Headings:* **1. Angular momentum flux 2. Extratropical cyclones. I. Massachusetts Institute of Technology II. Contract AF 19(122)-153.**—*Authors' abstract.*

5.11–87 551.513.2

*Essenwanger, Oskar, **Statistische Untersuchungen über die Zirkulation der Westdrift in 55 Breite.** [Statistical investigation of the west drift circulation at lat. 55°.] *Germany. Deutscher Wetterdienst, Berichte,* No. 7, **1953.** 22 p. 16 figs., 16 tables, 30 refs. **DWB**—

Frequency of troughs and ridges in the 500 mb niveau along 55°N are given for each season and each 10° longitude, based on a 3-year period. In addition, the duration and frequency of pressure formation originating at the corresponding longitudes is shown. Another table gives the frequency of blocking. Both ridges and troughs move to east in about 65% of all cases with a mean velocity of 10.5°/day and to west in 17% of all cases with a velocity of 7.8°/day, having a slight seasonal variation. The velocity over Atlantic is 20% greater than in America and 45% greater than in Europe. Furthermore, mean values and frequency distributions are given for the length and amplitude of long waves and the meridional gradient of the 500 mb surface, all of which have significant seasonal variations. Correlation coefficients show the interrelation of the parameters in Rossy's long wave formula. Empirical correlations are suggested. The frequency of jet streams is shown along the meridians 0°, 30° and 80°W. The change with time of the long wave parameters is studied for blocking situations. *Subject Headings:* **1. Trough frequencies 2. Ridge frequencies 3. Waves in the westerlies 4. Blocking action 5. Northern Hemisphere.**—*A.A.*

5.11–88 551.513.2:551.55

Foster, Robert L. and Robinson, Earl F. (*WBAN Analysis Center, U.S.W.B., Washington, D. C.*), **The strong jet over the Southwestern Plains States, November 24–25, 1953.** *Monthly Weather Review*, 81(11):374–378, Nov. **1953.** 8 figs., 2 refs. **MH-BH**—Presents 300 mb contour and isotach charts and 200 mb isotherm charts showing development and downstream motion of strong jet over Oklahoma and Texas Panhandle. The relation of the 300 mb jet to the tropopause-break lines shown on chart. The jet parallels and almost coincides with the tropopause-break. Jet also coincides with concentration of 200 mb isotherms (a factor not unrelated to tropopause-break [*ed.*]). Winds 250–300 kn were calculated for 40,000 ft and higher. A positive correction may be required for the anticyclonic circulation which existed over Oklahoma. *Subject Headings:* **1. Jet stream analysis 2. High level winds 3. Tropopause-break.**—*M.R.*

5.11–89 551.513.2:551.55

Riehl, Herbert, **Jet stream flight, March 23, 1953.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:56–66, **1954.** 8 figs., 4 refs., 2 eqs. English, German and French summaries p. 56. **MH-BH**—An account is given of a special flight across the jet stream at 300 mb from east coast to Chicago. Profiles are shown of wind speed and direction, temperature, isotachs and vorticity. Charts are given for surface, 500 and 300 mb. The structure was rather simple; speed showed a sharp peak of 190 kn over E. Michigan, falling off more sharply to left than right. The mechanism is discussed. *Subject Heading:* **1. Jet stream.**—*C.E.P.B.*

ATMOSPHERIC DISTURBANCES

See also: **Symposium on microseisms,** 5.11–8; **Radar spies on tornadoes** (Long), 5.11–27; **Thunderstorm forecasting in U. S.** (Forst), 5.11–54; **Prediction of tropical cyclone tracks** (Riehl, Haggard), 5.11–55; **Isobar refraction at air-mass boundaries** (Koschmieder), 5.11–116; **The meridional growth of squall lines** (Abdullah), 5.11–126; **Cloud streets and wind spout** (Feteris), 5.11–151.

5.11–90 551.515.11:551.515.1

Bjerknes, J., **The diffluent upper trough.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:41–46, **1954.** 2 figs., table, 4 refs., eq. English, German and French summaries p. 41. **MH-BH**—Deepening of a cyclone requires upper divergence above the center strong enough to exceed lower convergence. The best conditions are given by a diffluent trough in the upper westerlies. The trough line lies SE–NW and has a maximum wind speed to west of the trough line. Three conditions in which diffluent structure may be anticipated are set out. *Subject Headings:* **1. Upper level troughs 2. Cyclogenesis.**—*C.E.P.B.*

5.11–91 551.515.11(54

Jordan, Charles L. (*Univ. of Chicago*), **On the formation of the Masulipatam cyclone of 1949.** *Indian Journal of Meteorology and Geophysics*, 4(4):339–342, Oct. **1953.** 7 re

MH-BH—An attempt to explain the formation of the Masulipatam cyclone of Oct. 1949, nalyzed by SEN and GEORGE (*see item* 4.10–124, Oct. 1953, *MAB*) as being due to interaction of 3 air masses at a "triple point," as due rather to a vortex found where an upper westerly rough coincides with an equatorial trough along the boundaries of the 2 zones (according to he Riehl, 1948, model). Arguments pro and con the two schools of thought (frontal and non-rontal) are given, but without illustration in the form of charts or diagrams. *Subject Headings:* . **Cyclogenesis 2. Masulipatam, India 3. Bay of Bengal.**—*M.R.*

5.11–92 551.515.11:551.515.8

§Kruhl, Heinrich, **Zur Dynamik polarer Kaltluftausbrüche am Beispiel des Holland-Orkans rom 30.1–1.2.1953.** [On the dynamics of polar cold air outbreaks with the example of the Dutch hurricane of Jan. 30–Feb. 1, 1953.] *Annalen der Meteorologie*, 6(3/4):65–76, **1953/54.** 2 figs., 11 refs., 5 eqs. German and English summaries p. 65. **MH-BH**—A strong upper ropospheric cold air outbreak from Greenland over west and central Europe on Jan. 30, 1953 was subjected to great vertical stretching and horizontal shrinking causing development of yclonic rotation. Over the Atlantic the air below 500 mb extended horizontally and de-veloped anticyclonic rotation. This process is illustrated synoptically by surface isobars and pper air topography of the North Sea storm. The progress of the storm is shown by isolines of wind force 10 or more, isentropic surfaces and air trajectories. The analysis supports the heories of P. RAETHJEN and E. KLEINSCHMIDT, Jr. on cyclogenesis by inflow of polar strato-pheric air. *Subject Headings:* **1. Cyclogenesis 2. Polar outbreaks.**—*C.E.P.B.*

5.11–93 551.515.11

Raethjen, P., **Dynamische Zyklogenesis.** [Dynamic cyclogenesis.] *Archiv für Me-eorologie, Geophysik und Bioklimatologie, Ser. A*, 7:47–55, **1954.** 3 figs., 6 refs., 22 eqs. German, English and French summaries p. 47. **MH-BH**—The equations of dynamic cyclo-genesis (defined by EXNER as cyclogenesis without change of the temperature field) are set out, eading to an equation involving horizontal divergence. This depends on barotropic or baroclinic advection of absolute vorticity or more usually on a surface of discontinuity and the ntrusion of a wedge of cold air in the rear and retreat of warm air in the front. In a frontal yclone the air masses gain cyclonic vorticity in the rear and lose it in the front. *Subject Headings:* **1. Cyclone dynamics 2. Cyclogenesis.**—*C.E.P.B.*

5.11–94 551.515.21

Rodewald, Martin, **Die Höhenwind-Zirkulation um tropische Wirbelstürme.** [The pper wind circulation around tropical cyclones.] *Zeitschrift für Meteorologie*, 7(11):337–343, Nov. **1953.** 13 figs., refs. **MH-BH**—Study based essentially on radar wind data summarized by JORDAN (*see item* 4.2–118, Feb. 1953, *MAB*). RODEWALD emphasizes that the asymmetric listribution of radial velocities is connected with the migration of the cyclone. The pressure listribution at 45,000 ft height shows a well developed anticyclone to the right of a small yclonic center. The thermal wind distribution, computed from the change of the wind vector from 7,000 to 45,000 ft, is strictly anticyclonic and indicates a warm center. *Subject Headings:* **1. Tropical cyclones 2. Cyclone structure.**—*A.A.*

5.11–95 551.515.31

Ward, Neil B. (*WBO, Oklahoma City, Okla.*), **A process for the formation and maintenance of tornadoes.** Sept. 12, **1953.** 8 p. figs., 5 refs. Carbon of typescript. **DWB**—Tornadoes form in thunderstorm cells when an inversion limits the convective activity in all but a limited area. In these limited areas the restricting of the field of flow produces increased vorticity and centrifugal force which results in release of latent heat as the air expands adiabatically as it moves horizontally inward. Mass must be taken out at the top or the system would reach equilibrium. The release of latent heat of condensation results in the extension of the funnel cloud to the ground. The smaller the vortex the greater the increase in velocity as the vorticity is conserved. A model is presented to show the forces operating according to the above theory. *Subject Headings:* **1. Tornado formation 2. Tornado theory.**—*M.R.*

5.11–96 551.515.

Bugaev, V. A., **O progrevanii malopodvizhnogo antitsiklona.** [The warming up of slowly moving anticyclone.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia* 85(3):289–291, May/June **1953.** 3 figs., 4 refs. **DLC**—The warming up of an anticyclone considered as a process in which advective and transformational factors act in opposite direc tions. The warming up of an anticyclone is characterized by a process in which a cold a mass, during whose incursion southwards a surface anticyclone appears, is warmed up b transformation processes which include advection and subsidence. During the summe advection is considerable and transformation is intense. During winter this factor is sma and warming up is primarily a result of subsidence. In the atmosphere the anticyclone warm up by advective processes as a result of the flow of warm air. *Subject Headings:* **1. Anticyclon warming 2. Advection 3. Subsidence.**—*I.L.D.*

5.11–97 551.515.7:551.513:551.5

†Sumner, E. J., **A study of blocking in the Atlantic-European sector of the Northe Hemisphere.** *Royal Meteorological Society, Quarterly Journal,* 80(345):402–416, July 195 9 figs., 4 tables, 8 refs. **DWB**—After considering other definitions, "blocking" is regarded a an instantaneous state of circulation, illustrated by examples of "blocking patterns." involves a sharp local but rather persistent diminution of zonal tropospheric flow, often wit bifurcation of the jet stream. In 1949 through 1952, 53 blocks occurred with average duratio of 16.5 days. Maximum frequency was in May, least in July, and tended to move fro Europe to N. Atlantic in Jan.–June; they were rare in N. America. Blocks are classified Progressive, Quiescent and Retrogressive. Notes are given on their formation, dissipati and general characteristics. *Subject Heading:* **1. Blocking action.**—*C.E.P.B.*

5.11–98 551.515.73(26

*Genève, R., Jacquemard, G. and Piat, D. (*Établissement d'Études et de Recherches M téorologiques, Paris*), **Les hautes pressions permanentes de l'Atlantique Nord.** [Permane high pressure areas of the North Atlantic.] *Journal Scientifique de la Météorologie,* Par 5(17):1–15, Jan./March **1953.** 16 figs. French, English and Spanish summaries p. 1. **DW** —A statistical study of the duration frequency of anticyclones (pressure $\geq$1020 mb) over t North Atlantic during Jan. and July, based on 1949–1952 data and synoptic charts for th area. The North Atlantic is divided into 5 major regions and each region divided into sub-areas (5° squares of lat. and long.). Histograms show the relative frequency for ea respective year of the duration each month according to 5 class intervals of "anticyclone during Jan. and July, respectively. The same information is shown on 6 charts of the Nor Atlantic whereon frequencies in 3 intervals ($<$10, 10–19 and $\geq$ 20 days) are shown by degre of shading. These charts reveal the instability of the Azores (July) or Bermuda (Jan.) Hig *Subject Headings:* **1. Anticyclonic duration frequencies 2. North Atlantic.**—*M.R.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Infrared—spectroscopy . . .** (Jancke), 5.11–37; **Radiation measuring instrument . . .** (Schulze), 5.11–38; **Thermal effect of dust . . . during storms** (Bugaev et al), 5.11–129; **"Thermoperiodism" as a bioclimatic factor** (Burgos), 5.11–199.

5.11–99 551.521:551.5

Bell, Barbara (*Harvard Univ.*), **Solar variation as an explanation of climate cha** (In: Shapley, Harlow (*ed.*), **Climatic change.** Cambridge, Harvard Univ. Press, **1953.** p. 12 136. 4 figs., 8 refs.) **DLC**—After reviewing briefly BROOKS' explanation of the possi initiation of the Ice Age, Simpson's theory that ice ages result from an increase in solar radiati and Willt's modification of Simpson's hypothesis, namely, introducing four solar maxi instead of two, the author proposes these hypotheses: (1) "given a favorable topograp extreme glaciation results from a rise in the solar radiation, this rise occurring within a per

f general depression of the solar radiation"; (2) solar corpuscular radiation considerably tronger and more continuous than at present would favor the occurrence of a warm polar limate, while a weak corpuscular radiation would favor a cold polar climate and (3) minor limatic changes such as substages within the major glaciations may be the result of a variation n the direction of the magnetic axis. *Subject Headings:* **1. Radiation variations 2. Climatic hanges 3. Corpuscular radiation.**—*I.L.D.*

5.11–100 551.521.1

†Black, J. N.; Bonython, C. W. and Prescott, J. A., **Solar radiation and the duration of unshine.** *Royal Meteorological Society, Quarterly Journal,* 80(344):231–235, April **1954.** g., 3 tables, 24 refs., 2 eqs. **MH-BH**—Constants a and b of expression $Q/Q_A = a + bn/N$ here Q is radiation received, Q_A astronomically possible, n, N are actual and possible sunshine uration, were calculated for 32 stations. Values are given for 7 groups by latitude. *Subject leadings:* **1. Solar radiation 2. Sunshine duration.**—*C.E.P.B.*

5.11–101 551.521.1

Collmann, Wolfgang, **Idealwerte der Globalstrahlung.** [Standard values of global adiation.] *Annalen der Meteorologie,* 6(3/4):117–122, **1953/54.** 4 tables, 26 refs. German nd English summaries p. 117. **MH-BH**—Daily sums of total radiation on a horizontal urface are computed for transmission factors 1.0 and 0.8 (global radiation), using an approxi- nate formula, for 16 dates and latitudes 30–65°N. Solar constant is taken as 1.94 cal/cm²/min. s an example of the use of the table, daily sums are given for Hamburg. *Subject Heading:* . **Global radiation.**—*C.E.P.B.*

5.11–102 551.521.1

Lossnitzer, H., **Zum Strahlungsklima des Breisgaues.** [Radiation climate of Breisgau.] *Baden. Landeswetterdienst, Jahresbericht mit Abhandlungen,* **1951/1952.** p. 151–153. 3 ables. **DWB**—Intensity of direct solar radiation, turbidity factor, polarization and color of he zenith sky are compared for solar heights from 20–65°. Some extreme radiation values re discussed. *Subject Headings:* **1. Solar radiation 2. Polarization 3. Sky light color . Freiburg, Germany.**—*A.A.*

5.11–103 551.521.1(26) 551.521.32(26)

*Sauberer, F. and Dirmhirn, Inge, **Über den Strahlungshaushalt der Ozeane auf der ordhalbkugel.** [On the radiation balance of the oceans in the Northern Hemisphere.] *rchiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,* 6(1/2):113–127, **1954.** 3 figs., tables, 14 refs. German, English and French summaries p. 113–114. **DWB**—Authors ummarize empirical data bearing on radiation balance. Short wave sun, sky and global diation are related to sunshine duration in March and Sept., June, and Dec. Albedo of ater surface is discussed for different solar heights and the short wave radiation balance is bulated. Long wave radiation balance is discussed in terms of water vapor and cloudiness. harts are constructed for Pacific and Atlantic oceans (60°N—0°, 180°—10°W) showing ort and long wave radiation balances separately for June and Dec. and total radiation balance r March, June, Sept. and Dec.). In winter the influence of latitude predominates, in summer at of cloudiness (high and low pressure areas). *Subject Headings:* **1. Radiation balance Oceans.**—*C.E.P.B.*

5.11–104 551.521.11(449.91,448.9)

Burban, A. and Mironovitch, V., **Durée d'insolation à Saint-Hilaire-du-Touvet et à ont-Romeu.** [Duration of sunshine at Saint-Hilaire-du-Touvet and at Font-Romeu.] *a Météorologie,* Paris, 4th Ser., No. 29:76–79, Jan./March **1953.** 2 figs. French, English and panish summaries p. 76. **MH-BH**—Comparative curves for each month from Jan. 1932–ec. 1937, and mean monthly values for 1932–1952 at St. Hilaire (at 1150 m in Isère) and 932–1936 at Font-Romeu (E. Pyrenees) show that Font-Romeu receives more hours of unshine throughout the year but a smaller "percentage of possible" in the spring (greater % autumn and winter) than St. Hilaire, which is farther north and in the mountains. *Subject eadings:* **1. Sunshine duration 2. France 3. Pyrenees.**—*M.R.*

5.11–105 551.521.1

Schulze, R., **Strahlungsempfang geneigter ebener Flächen.** [Radiation on inclined planes.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,* 6(1/2):128–138 **1954.** 7 figs., 2 tables, 6 refs. German, English and French summaries p. 128–129. **DWB**—Daily sums of sun+sky radiation were recorded at Hamburg, using solarimeters with surfaces horizontal, vertical facing N, E, S and W, and at 45° facing S. Results are shown in cal/cm²/day and as ratios to horizontal surface (clear and cloudy days) and to extraterrestrial radiation. By using colored surfaces instead of black, variations of ratios 450/550 mμ and 644/550 mμ were obtained for different sun heights 10–58°, in sun and shade. *Subject Headings:* **1. Solar radiation measurement 2. Hamburg, Germany.**—*C.E.P.B.*

5.11–106 551.521.12:551.555.

*Thams, J. Chr., **Die Intensität der direkten Sonnenstrahlung bei Nordföhn auf der Alpensüdseite.** [Intensity of direct solar radiation during north föhn on the south side of the Alps.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,* 6(1/2):139–151, 1954 6 tables, 7 refs. German, English and French summaries p. 139. **DWB**—Hourly measurements of direct solar radiation at Locarno-Monti (380 m) on days of north föhn are tabulated and compared with mean values at Davos. This shows that on such days radiation is equivalent to normal above 1600 m. Maximum noon values ranged from 1.32 cal/cm²/min in Dec. to 1.49 in April. This is due to very dry clear air (v.p. down to 0.3 mm in Feb. and 4 mm in July). *Subject Headings:* **1. Solar radiation data 2. Föhn effects 3. Swiss Alps.**—*C.E.P.B.*

5.11–107 551.521.3:551.593

Lossnitzer, H., **Strahlungsmessungen als Hilfsmittel zur Diagnose atmosphärischer Zustände und Vorgänge.** [Radiation measurements as an aid to diagnosis of atmospheric conditions and processes.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,* 6(1/2):91–112, **1954.** 12 figs., 3 tables, 16 refs. German, English and French summaries p. 91–92. **DWB**—Sky radiation offers a way of measuring and analyzing turbidity. The instrumental setup and observation technique for studying zenith radiation of different wavelengths and zenith polarization at different sun heights and degrees of turbidity at Freiburg i. Br. 1947–53 are described and the results set out in numerous diagrams. The measurement of long wave radiation (sky minus ground) is briefly discussed and illustrated. *Subject Headings:* **1. Sky brightness 2. Polarization 3. Turbidity.**—*C.E.P.B.*

5.11–108 551.521.

Möller, F., **Ein Kurzverfahren zur Bestimmung der langwelligen Ausstrahlung dicker Atmosphärenschichten.** [A short procedure for determining the long-wave outradiation of thick atmospheric layers.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* 7:158–169, 1954. 4 figs., 4 tables, 12 refs., 5 eqs. German, English and French summaries p. 158–159. **MH-BH**—In mathematical extended forecasting it is necessary to take account of the import of energy into the atmosphere. Author sets out a rapid method. For a series of standard atmospheres with the same gradients of temperature and humidity but different absolute values, the net radiation flux at 400 mb can be computed with sufficient accuracy from temperature and dew point at 400 mb. Working diagrams are given, including allowance for cloud layers, and an example of practical calculation. *Subject Heading:* **1. Outgoing radiation.**—*C.E.P.B.*

AIR TEMPERATURE

See also: **The baric preparation of the European winter of 1954** (Rodewald), 5.11–53; **Measurement of ozonosphere temp.** (Momin), 5.11–63; **Intensity of evaporation from lakes** (Skibniewski), 5.11–139; **Estimating snow melt runoff from air temp.** (U.S.W.B.), 5.11–173; **Relation between temp. and melting water** (Zingg), 5.11–174; **Air temp. in winter on the sloping field** (Tsuboi), 5.11–189; **Secular changes of solar activity** (Eigenson), 5.11–208.

5.11–109 551.524.31:55

*Conrad, Victor, **The semidiurnal temperature wave and peculiarities of the diurnal variations of temperature on mountain summits.** *Geofisica Pura e Applicata,* 26:88–96, 19

figs., 2 tables, 10 refs. **MH-BH**—An analysis of curves of monthly average diurnal temerature variations on Mt. Washington, N. H. shows that in about half of the months of Nov.–eb. inclusive for years 1935–37 and 1941–50 the minimum occurred in the evening (about) h) rather than in the morning and a secondary maximum about 2 a.m. This same anomalous ndition was observed in records from Obir-Hannwarte, Austria (7024 ft) during 1892–99. he probability of an evening minimum is 54% in Dec. and Jan., only 8% in Sept. and April id nil in May–Aug. at Mt. Washington. At the Austrian station the probability in Nov. id Dec. is 71% and 86%, respectively, and in Nov.–Feb. 50% as on Mt. Washington. Effect explained by means of harmonic analysis as superposition of semidiurnal wave on a weak urnal (insolation) wave. *Subject Headings:* **1. Diurnal temperature variations 2. Semiurnal temperature wave 3. Mountain meteorology 4. Harmonic analysis 5. Mt. Washgton, N. H. 6. Obir-Hannwarte, Austria.**—*M.R.*

5.11–110 551.524.31:551.574.41

Monteith, J. L. and Saunders, W. E., **Night cooling under clear skies.** *Royal Meteorogical Society, Quarterly Journal,* 80(345):457–459, July **1954.** 11 refs. **DWB**—Monteith jects suggestion by Saunders (*Ibid.*, 80:105, 1954) that dew formation is responsible for scontinuities in nocturnal cooling and attributes the latter to a sudden burst of turbulent tivity. Saunders regards the objections as not conclusive. *Subject Headings:* **1. Nocturnal ooling 2. Dew.**—*C.E.P.B.*

5.11–111 551.524.7:551.547

Bannon, J. K., **Classification of upper air temperature according to tropopause pressure.** *reat Britain. Meteorological Office, Professional Notes,* 7(112), **1954.** 20 p. 4 figs., 5 tables, 4 refs. **MH-BH**—Observations at Larkhill for Jan., April, July and Oct. 1948–1950 were rouped in 20 mb steps of tropopause pressure. Mean temperatures and S.D.s at 500, 400, 00, 200, 150 and 100 mb are plotted for each group for each season, showing stratosphere ecoming steadily warmer and troposphere colder with increasing tropopause pressure. Lapse tes are given for layers just below, just above and well above tropopause. Statistics of opopause pressure are given. Correlation coefficients for different pressure steps between mperatures and pressures at various levels and height of 300 mb level are given. The arious relations are discussed; it is shown that classification of tropopause by height or essure is essential for statistical analysis. *Subject Headings:* **1. Upper air temperatures Tropopause pressures.**—*C.E.P.B.*

5.11–112 551.524.7:551.510.53

Bannon, J. K., **Variation of temperature in the lower stratosphere above Larkhill and erwick.** *Great Britain. Meteorological Research Committee, M.R.P.*, No. 860, March 27, **954.** Mimeo. 4 p. 7 tables, 3 refs. **GB-MO**—The correlations obtained in *M.R.P.* o. 819 (*see item* 5D–218, April 1954, *MAB*) for 60 mb were based on few observations. orrelation coefficients of temperature at 150, 100 and 60 mb with height of 300 mb surface id with tropopause pressure, based on all available data, are tabulated separately for day id night. Those with H_{300} are negative, those with P_T positive; in both cases magnitude ecreases to less than a half between 150 and 60 mb. The decrease is greatest in Jan. and pril and least in Oct. and may be related to annual variation of ozone. *Subject Heading:* **Upper air temperatures.**—*C.E.P.B.*

5.11–113 551.524.7(988)

†*Belmont, A. D., **Apparent diurnal and seasonal variations of upper air temperature at arsarssuak, Greenland.** California. Univ. at L. A. Dept. of Meteorology, Contract AF)(122)-228, Scientific Report, No. 1, Jan. **1954.** 66 p. 7 figs., numerous tables, refs. p. 29–30, ls. **MH-BH**—This report presents elaborate summarization of 3 or 4 times daily radiosonde ata on temperature and diurnal variations in temperature at the surface, 900, 700, 500, 400, 00, 250, 200, 175, 150, 125, 100, 80, 60, 50 and 40 mb for each month and season during the eriod Jan. 1946–Dec. 1948. At station BW–1 on the SW coast of Greenland and at Thule ct. 1946–Dec. 1949, diurnal and seasonal variations are plotted for each level. The ethods of analysis and some conclusions regarding diurnal and seasonal variations and xtremes are set forth in the text. *Subject Headings:* **1. Upper air temperature data 2. Diurnal**

upper air temperature variations 3. Radiosonde data 4. Narsarssuak, Greenland 5. Thule Greenland. I. California. Univ. at L. A. Dept. of Meteorology II. Contract AF(122)-228 —*M.R.*

SOIL TEMPERATURE

See also: **Microclimatic effect of irrigation of corn** (Vásárhelyi), 5.11–188.

5.11–114 551.525.2:551.584:551.57

*Johns Hopkins University. Laboratory of Climatology, **Quarterly summary of observa tions made at Seabrook, N. J.,** July 1–Sept. 30; Oct. 1–Dec. 31, **1952;** Jan. 1–March 31 April 1–June 30; July 1–Sept. 30; and Oct. 1–Dec. 31, **1953.** Contract AF 19(604)-28 Scientific Reports, No. 1, 2, 3, 4, 6 and 7, 1952, 1953. 6 pieces. mostly tables. These ar also its: *Publications in Climatology*, 5(7 and 8), **1952** and 6(3, 4, 6 and 7), **1953. DWB– Quarterly Summary of Observations made at Seabrook, N. J.** is a continuation of dat (micrometeorological profiles for selected days, radiation, evapotranspiration, temperature precipitation, etc.), published previously in the 18 Interim Reports on its **Micrometeorolog of the Surface Layer of the Atmosphere** (*see item* 4B–326, Feb. 1953, *MAB*). A new metho of measuring directly the soil surface temperature is introduced, using a probe consisting a copper-constantan, butt-soldered thermojunction. The junction was brought to a very ligh contact with the soil surface and was held until a maximum was indicated. *Subject Heading* **1. Micrometeorological data 2. Soil surface temperature measurement 3. Seabrook, N. I. Contract AF 19(604)-289.**—*A.A., I.L.D.*

5.11–115 551.525.4:551.588.6(75

*Greene, Geoffrey E., **Soil temperature in the South Carolina Piedmont.** *U. S. Fore Service. Southeastern Forest Experiment Station, Asheville, N. C., Station Paper*, No. 2 Sept. **1953.** 16 p. 5 figs., 2 tables, 9 refs. **DWB**—Daily soil temperatures at depths of 2, 1 18, 24, 26, 48, 60 and 72″ are tabulated and averages shown on graphs for each month fro Sept. 1950–Oct. 1951 for 4 sites in the Piedmont Section of South Carolina. One site was in 58-year old mixed forest, one in 11-year old pine woods, one in a broomsedge field and one on barren eroded area. There is a lag of 2 months in the maximum and minimum soil tem perature compared with maximum and minimum air temperature, respectively. Under heavy forest cover the annual range of soil temperature is less than under barren condition At 6′ depth the temperatures in Feb. do not vary with change of cover, but in Aug. it is warmer under bare ground (74°) than under heavy cover (66°F). *Subject Headings:* **1. S temperature data 2. Forest influences 3. Union, South Carolina.**—*M.R.*

PRESSURE AND WIND

PRESSURE

See also: **Classification of upper air temp.** (Bannon), 5.11–111.

5.11–116 551.542:551.51

Koschmieder, H., **Die Isobarenbrechung an Luftmassengrenzen.** [Isobar refraction air mass boundaries.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:67– **1954.** 8 figs., 2 tables, 13 eqs. German, English and French summaries p. 67. **MH-BE** Refraction of isobars at a front is discussed by considering "disturbance isobars" due to a c wedge superposed on basic equidistant straight isobars preceding the front. The refract angles and final isobars are calculated. Refraction is discussed in a squall, a storm l lying along the wind direction, and the pressure field in an asymmetric depression. *Sub Heading:* **1. Frontal structure.**—*C.E.P.B.*

5.11–117 551.543:5

Berg, Hellmut and Rudloff, Willy, **Polschwankungen und Luftdruckschwankun** [Pole movements and pressure variations.] *Annalen der Meteorologie*, 6(3/4):110–

953/4. 2 tables, 2 refs. **MH-BH**—To check RUDLOFF's high correlation (1950) between movements of pole of rotation and pressure two months earlier, BERG compares position of pole in Sept. 1900–1933 with mean July pressure north of 20°N, but correlation is only −0.193. Correlations between range maximum-minimum are also small. RUDLOFF criticizes BERG's treatment and adduces further evidence in favor of his own correlation. *Subject Headings:* **1. Pressure changes 2. Polar orbit.**—*C.E.P.B.*

5.11–118 551.543.3

Fuchs, J., **Der 12 Tage-Rhythmus im europäischen Grosswetter.** [The 12-day rhythm in European weather.] *Archiv für Meteorologie Geophysik und Bioklimatologie, Ser. A*, 7:199–218, **1954.** 6 figs., 4 refs. German, English and French summaries p. 199. **MH-BH**—The existence of a 12-day pressure wave in central Europe is shown by 5-day mean curves for Berlin. Individual waves varied from 10–14 days; the mean is 12.6 days but after eliminating breaks, 11.6 days. The duration is governed by time necessary for cold air masses over Europe to warm up. The 500 mb level shows a similar rhythm but with a phase shift of 90°. The synoptic changes in Atlantic (6-day wave) and Europe are discussed in terms of Azores High and anticyclones and depressions travelling from west. Related rhythms in weather are discussed. *Subject Heading:* **1. Pressure waves.**—*C.E.P.B.*

TURBULENCE AND GUSTINESS

See also: **Atmospheric diffusion calculation** (Gifford), 5.11–23; **Anemometer for micrometeorological investigation** (Gill), 5.11–42.

5.11–119 551.551

Davies, D. R., **A note on the two-dimensional equation of diffusion in the atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 80(345):429–434, July **1954.** 2 tables, 4 refs., 3 eqs. **DWB**—In this paper the shearing advection term, suggested recently by H. LETTAU, is introduced into the well-known two-dimensional equation formulated by SUTTON and CALDER in their treatment of turbulent diffusion, and a solution of the ensuing equation is obtained subject to the conditions prescribed by the problem of diffusion from an infinite continuous line source, situated at ground level and orientated in a direction normal to that of the mean wind velocity. The predicted values of cloud height and peak concentration at a distance of 100 m downwind of the source, when compared with previous theoretical values and available experimental results in *neutral stability conditions*, show that no significant change in theoretical values is obtained by the introduction of Lettau's term, and the order of magnitude of the deviation from the Calder prediction produced by this term is found to be the same *at all distances* downwind of the source. The shearing advection term may consequently be ignored *in the conditions investigated. Subject Heading:* **1. Turbulence theory.**—*Author's abstract.*

5.11–120 551.551

Kohlbach, Walter, **Böigkeitswindrose für den Böenschreiber des Wetteramtes Hannover.** [Gust wind rose for the gust recorder at Hannover Weather Office.] *Annalen der Meteorologie*, 7(3/4):123–124, **1953/54.** fig. **MH-BH**—Using only hours in which wind direction and mean speed changed little, differences between highest and lowest gusts in each 10 minutes were tabulated and mean divided by mean hourly wind speed. The ratios are plotted as a 16 point wind rose. Winds reaching the airfield over open ground have a low ratio, those from forest or buildings a high ratio. *Subject Heading:* **1. Gustiness.**—*C.E.P.B.*

5.11–121 551.551

McCormick, Robert A., **The partition and intensity of eddy energy at the 91-metre level during unstable conditions as observed at Brookhaven National Laboratory.** *Royal Meteorological Society, Quarterly Journal*, 80(345):359–368, July **1954.** 8 figs., table, 17 refs. **DWB**—Daytime measurements of three components of turbulence (time unit 10 sec) with accompanying temperature and wind gradients 125–11 m and wind speed at 91 m are analyzed. Total eddy energy (sum of squares of departures from 57 min means corrected for trend) is pro-

portional to eddy supply but not related to vertical temperature and velocity gradient. Relations to energy supply are plotted separately for overland and oversea air, and for sma (20 sec–2.5 min), medium (2.5–17 min) and large (17–57 or 114 min) eddies. Difference are not clear-cut but ratio of eddy conductivity to eddy viscosity is 3–6 times greater f overland than oversea air. Other properties analyzed are relation of cross-wind to vertic eddy energy, intensity of turbulence, Reynolds stress and eddy viscosity. *Subject Heading* **1. Turbulence spectrum 2. Eddies 3. Brookhaven Laboratory, Upton, N. Y.**—*C.E.P.B.*

5.11–122 551.551:551.557(4

*Peppler, W., **Böigkeit in der freien Atmosphäre und Wetterlage.** [Turbulence in th upper atmosphere and weather conditions.] *Germany. Deutscher Meteorologischer Dien im Französischen Besatzungsgebiet, Wissenschaftliche Arbeiten*, 1:136–138, **1947.** 3 figs., tabl **DLC**—A study of vertical and horizontal turbulence (North–South and East–West) at 0–5 k based on airplane observations made at Königsberg aerological station 1934–39. *Subje Headings:* **1. Upper air turbulence 2. Airplane observations 3. Königsberg, Germany.** *M.R.*

5.11–123 551.551:551.5

Scrase, F. J., **Turbulence in the upper air, as shown by radar-wind and radiosonde mea urements.** *Royal Meteorological Society, Quarterly Journal*, 80(345):369–376, July 195 4 figs., table, 14 refs. **DWB**—For a sounding in S.E. England June 29, 1949, the S.D.s deviations of components of distances travelled in successive minutes from smoothed mean corrected for random errors of measurement, and similar observations of temperature at m intervals, gave:

Height km	1–12	12–21	21–31
Horizontal component kn	2.6	4.5	5.0
Vertical component kn	1.1	1.5	2.2
Temperature °F	0.85	0.64	0.29

Fluctuations of horizontal component are about 10% of mean wind. Periods of wind and ter perature fluctuation were 3–4 min. Calculated diameter of eddies 10,000 ft horizontal a 5,000 ft vertical. (*See also item* 4.11–62, Nov. 1953, *MAB.*) *Subject Heading:* **1. High lev turbulence.**—*C.E.P.B.*

5.11–124 551.5

Suzuki, H., **The gusts in the Inland Sea.** *Journal of Meteorological Research*, Toky 4(9):659–661, Feb. **1953.** 3 figs., table. In Japanese; English summary p. (40)–(41). **M BH**—A table showing the number of storms with and without gusts for each month of t period 1945–1949 is presented (for Matsuyama). Synoptic situations liable to generate gus and indicators of gust tendency are described. *Subject Headings:* **1. Gusts 2. Matsuyam Japan.**—*G.T.*

WIND VARIATIONS

5.11–125 551.553.

Bossolasco, Mario, **L'irruzione del monsone di SW in Somalia.** [Onset of the southw monsoon in Somaliland.] *Geofisica e Meteorologia*, Genoa, 1(6):97–99, Nov./Dec. 19 fig., 3 refs. **MH-BH**—The southwest monsoon sets in during April and May along the co of Somaliland at a progressively later date as one goes from Guimbo to the northeast pa Mogadiscio to Bulo Burti. According to the isochronal chart presented by the author, t difference is 18 days from the southwest to the northeast extremity of Somaliland. *Subj Headings:* **1. Monsoon isochrones 2. Southwest monsoon onset 3. Italian Somaliland.** *M.R.*

5.11–126 551.553.8:551.51

Abdullah, Abdul J., **The meridional growth of squall lines.** *Journal of Meteorolo* 11(4):301–308, Aug. **1954.** 7 figs., 7 refs., 26 eqs. **DWB**—A squall line may develop ahe of the cold front in an occluding cyclone, and sometimes grows in length, usually to the rig

t is accompanied by a pressure wave which "breaks," forming a pressure jump progressing way from the center, with associated disturbed weather. An idealized case is examined and method of forecasting growth and decay of squall lines is described. *Subject Heading:* . **Line squalls.**—*C.E.P.B.*

5.11–127 551.554:551.465

Hesselberg, Th., **The Ekman spirals.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:329–343, **1954.** 5 figs., 5 refs., 24 eqs. English, German and French ummaries p. 329. **MH-BH**—The equations of the Ekman spirals showing variation of wind rift with depth below sea surface and of wind with height above ground are set out. The heory is shown to be valid for a state of equilibrium without any other assumptions, in spite f variation of surface friction. The spirals in sea and atmosphere are related. *Subject leadings:* **1. Ekman spiral 2. Wind profiles 3. Wind driven currents.**—*C.E.P.B.*

SPECIAL WINDS

See also: **Intensity of solar radiation during north föhn** (Thams), 5.11–106; **Stratification of upper air currents . . .** (Kuhlbrodt), 5.11–135.

5.11–128 551.555.4:551.311.12

Hoinkes, H., **Beiträge zur Kenntnis des Gletscherwindes.** [Contributions to knowledge f the glacier wind.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 6(1/2): 6–53, **1954.** 7 figs., 4 tables, 24 refs., 11 eqs. German, English and French summaries . 36–38. **DWB**—Glacier winds in E. Alps were studied on 45 days in summers 1950–53. Diurnal variation shows two nearly equal maxima preceding sunrise and sunset and minima preceding noon and midnight. Maximum velocity approaches 3 m/s below 2½ m height, with n exponential profile. Temperature decreases by several °C in lowest meter; much more han in air from bare ground. Variations of several degrees in 10–14 min are due to turbulent nixing of air. A relatively large amount of heat passes from air to ice so that glacier wind annot protect ice from melting. *Subject Headings:* **1. Glacier winds 2. Alps.**—*C.E.P.B.*

5.11–129 551.555.8:551.521.31

Bugaev, V. A.; Dzhordzhio, V. A. and Dubentsov, V. R., **O termicheskom effekte pyli ri pyl'nykh i peschanykh buriakh.** [The thermal effect of dust during dust and sand storms.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geograficheskaia*, No. 3:44–45, **1952.** 4 refs. **DLC**—A brief article in which the authors acknowledge their error in giving the name of "Durst effect" to the phenomenon of temperature rise in the lower atmospheric layers caused by strong winds accompanied by dust and sand storms. In such cases sand or dust particles heated at he ground, when lifted into the air, warm it up. Moreover the suspended particles are directly heated by the sun which increases their heat emission to the air. As result of these effects and of turbulent intermixing, there takes place a rapid and important warming up of the ower (300–500 m height) air layer, resulting in a paradoxical warming up by intrusions of cold ir. The authors assert that the phenomenon was known to the Russian climatologist Voeĭkov nd was described in his paper "Mountain and steppe dry winds (sukhovei)" published in 912 and propose to name it "Voeĭkov's effect" instead of "Durst effect." *Subject Headings:* . **Temperature inversions 2. Atmospheric absorption 3. Dust storms.**—*A.M.P.*

WIND EFFECTS

See also: **Role of wind in the climate of Lower Silesia** (Schmuck), 5.11–207.

5.11–130 551.556:551.46

Francis, J. R. D., **Wind stress on a water surface.** *Royal Meteorological Society, Quarterly Journal*, 80(345):438–443, July **1954.** 5 figs., table, 13 refs. **DWB**—Recent attempts to determine wind stress τ_0 on a water surface in a tunnel or on lakes are summarized. Diagrams show stress coefficient $C=\tau_0/\rho u^2$ plotted against wind speed u. It is concluded that C increases nearly linearly with u. *Subject Headings:* **1. Wind stress 2. Water surface.**—*C.E.P.B.*

5.11–131 551.556:532.59:551.48

Haurwitz, Bernhard, **The slope of lake surfaces under variable wind stresses.** *U.* *Beach Erosion Board, Technical Memorandum*, No. 25, Nov. **1951.** 22 p. 7 figs., eqs. **DWB**— The inclination of a lake surface, caused by a wind stress, shows a distinct time lag in adjustin itself to changing winds. To analyze this phenomenon use is made of the hydrodynami equations which are simplified by integrating over the whole depth of the lake. It is foun that the time required by the lake to respond to changing wind stresses depends on the lengt of the seiche periods. This dependence of the rapidity with which the lake level adjus itself to the variable wind can be expected *a priori*. Particular attention is given to the cas of a wind which changes its direction. Such a wind shift took place during the passage of th hurricane of 26–27 August, 1949, over Lake Okeechobee, Florida, when the wind turned throug about 180° during a time of roughly three hours. This turning of the wind was accompanie by a turning of the height contours of the lake surface, but the latter rotated more slowly tha the wind direction so that for some time the wind blew parallel rather than perpendicular to th isohypses. It is shown that the theory explains this behavior of the lake surface. *Subje Headings:* **1. Lake surface slope 2. Wind stress 3. Lake Okeechobee, Florida.**—*Author abstract.*

5.11–132 551.556:532.59:551.48

Kajiura, K. (*Geophysical Inst., Tokyo Univ.*), **The effect of winds on the stratified lak water.** *Oceanographical Society of Japan, Tokyo, Journal*, 8(2):67–71, Dec. **1952.** 2 figs 3 refs., 9 eqs. **DWB**—The surface elevation in a stratified lake due to wind stress is essentiall related to the thickness of the upper layer, while the depth of the lake itself is not importan The slope of the surface is proportional to the square root of the distance from a point, which determined by the width of the lake, the depth of the upper layer, the density differen and the wind stress. *Subject Headings:* **1. Wind stress 2. Wind effects on lakes 3. Lak stratification 4. Water surface slope 5. Lake Suwa, Japan.**—*A.A.*

5.11–133 551.556:551.4

Neumann, G., **Zur Charakteristik des Seeganges.** [On the characteristics of sea di turbance.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:352–377, 195 6 figs., 4 tables, 15 refs., 19 eqs. German, English and French summaries p. 352–353. **MI BH**—The characteristics (period and height) of the fully developed wave spectrum und different wind forces are deduced and shown to agree with observations. A new detail scale of sea disturbance in relation to wind is suggested. *Subject Headings:* **1. Sea disturban 2. Wind effects.**—*C.E.P.B.*

UPPER AIR WINDS

See also: **Ozone layer and air movements in the stratosphere** (Paetzold), 5.11–64; **The strong jet stream over the SW Plain States** (Foster, Robinson), 5.11–88; **Jet stream flight, March 23, 1953** (Riehl), 5.11–89; **Study of blocking in . . . Northern Hemisphere** (Sumner), 5.11–97; **Turbulence in the upper atmosphere . . .** (Peppler), 5.11–122; **Turbulence in the upper air . . .** (Scarse), 5.11–123.

5.11–134 551.557.31:551.510

Johnson, D. H., **Diurnal and semi-diurnal oscillations of the lower stratosphere.** *Gr Britain. Meteorological Research Committee, M.P.R.*, No. 861, May 11, **1954.** Mim 5 p. 6 figs., 6 tables, 4 refs., 4 eqs. **GB-MO**—Changes of wind in 6 hours at 100 mb o Britain in 1950–51 show significant variations which are similar in each month. These analyzed harmonically; the mean amplitude of the diurnal component is 0.54 kt from S a 0.51 from E; semidiurnal 0.67 from S and 0.51 from E; both give elliptical paths (diur NW at 0 h; semidiurnal NE at 9 and 21 h.) The variations are attributed to solar tid *Subject Headings:* **1. Upper air wind variations 2. Stratospheric winds 3. Solar tides** *C.E.P.B.*

5.11–135 551.557(263):551.55

*Kuhlbrodt, E., **Schichtung der Hauptluftströmungen über dem atlantischen Geb 5°N. bis 9°S., 10°W. bis 5°E. (Region südlich der Oberguineaküste).** [Stratification of

pper air currents over the Atlantic 5°N–9°S, 10°W–5°E (south of the Upper Guinea coast).] *rchiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:170–187, **1954.** 5 figs., tables, 10 refs. German, English and French summaries p. 170–171. **MH-BH**—Mean and E components are found for winds in nine 5° squares in 5°N–10°S, 10°W–5°E, northern nter and summer, up to 19 km. These are represented by vectors; mean and maximum alar velocity are also tabulated. The air currents in each km of height are then discussed. eneralized system is: 1) Lower troposphere, monsoon, anti-monsoon, trade wind; 2) Middle oposphere, east wind (*Urpassat*); 3) Upper troposphere, upper west wind (anti-trade); Tropopause generally coincides with transition from west to east winds (upper trade) at –16½ km. At the equator there is mass transport from S to N at 0–1 and 16–17 km, from to S in 1–3 km, convergence 3–8 km and divergence 8–16 and 17–19 km. *Subject Headings:* **Upper air winds 2. Trade winds 3. Atlantic Ocean.**—*C.E.P.B.*

5.11–136 551.557:551.510.52/3

Schneider-Carius, Karl and Faust, Heinrich, **Grundschicht und Nullschicht der Atosphäre.** [Ground layer and zero layer of the atmosphere.] *Geofisica Pura e Applicata*, :119–126, **1953.** 4 figs., 14 refs. In German. English and German summaries p. 119. **WB**—Over Europe it was found that the level where vertical motion of deep cyclones and ticyclones averages zero is about 10 km. This "zero layer" is about the same as the level maximum wind and the level of greatest non-geostrophic mass transport from low to high essure, and the level of greatest angle between observed and geostrophic wind, and is thus e counterpart of the ground layer where the same thing occurs only in the opposite sense. he theory is developed and supported by schematic diagrams and graphs. *Subject Heading:* **Tropopause wind maximum.**—*From authors' abstract.*

VERTICAL MOTION

See: **Heat convection and buoyancy effects in fluids** (Batchelor), 5.11–73.

AQUEOUS VAPOR AND HYDROMETEORS

EVAPORATION

See also: **Meteorology as an exact science** (Sutton), 5.11–51; **Quarterly summary of observations made at Seabrook, N. J.** (Johns Hopkins Univ.), 5.11–114.

5.11–137 551.573:551.578.11

Dufour, Louis, **Sur la chaleur de vaporisation d'une gouttelette de solution en suspension ns l'atmosphère.** [On the heat of vaporization of a droplet of solution suspended in the mosphere.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:227–230, **54.** table, 4 refs., 8 eqs. French, German and English summaries p. 227. **MH-BH**— n expression is developed for heat of vaporization of a droplet of water in the atmosphere mpared with that of an equal volume from a plane water surface. Ratio for pure water ries from 1.000 for drop radius 10^{-5} to 0.938 for radius 10^{-7} cm. Values are also given for all and large nuclei. *Subject Heading:* **1. Evaporation of raindrops.**—*C.E.P.B.*

5.11–138 551.573:551.579

Kalweit, Heino, **Lysimeterbeobachtungen als Grundlage zur Berechnung des Wasserushaltes.** [Lysimeter observations as the basis for computation of water balance.] *Zeitschrift für Meteorologie*, 7(2):35–42, Feb. **1953.** 4 figs., 3 tables, 4 refs. **MH-BH**—Study sed on lysimeter observations made in Eberswalde. Percentage of annual evapotranspiran given for each month and different kinds of plant cover. Annual values: bare soil, 216; ass cover without ground water, 358; with ground water, 696 and with young pines, 450 mm. he author tested 16 empirical combinations of formulas, based on saturation deficit (S), mperature, precipitation (N) and water reserve in the soil (W_n), in order to compute evapoanspiration (V) from month to month (all in mm). The best results were obtained by

$V_w = -7.75 + 19.03 \sqrt{S}$ for the winter months and $V_s = 21.8 + 8.199\ S - 3646 \left(\frac{N+W_n}{S} \right.$

for the summer months. Author proposes to use these formulas also for catchment area *Subject Headings:* **1. Evapotranspiration 2. Lysimeter observation 3. Hydrologic cyc 4. Eberswalde, Germany.**—*A.A.*

5.11–139 551.573:551.524(2

Skibniewski, Leonard, **Szynniki wpływajace na wysokość parowania z jeżior na ni polskim.** [Factors influencing the intensity of evaporation from the lakes of the Poli Lowland.] *Gospodarka Wodna*, Warsaw, 13(6):209–210, June **1953.** 2 figs., 2 tables, r **DLC**—A paper in which the author objects to DERSKI's assertion that besides atmosphe moisture deficit and water temperature, the temperature of the air is the most decisive factor evaporation from lakes. On the basis of results of instrumental investigations carried out a series of Polish lakes, it is shown that aside from the water temperatures, the most i portant factors influencing the intensity of evaporation are: atmospheric moisture deficit a the duration of sunlight. He concludes that while from April to July the intensity of evapo tion is influenced by three parallel factors: water temperature, moisture deficit and durati of sunlight in the period July–Aug., it is only the water temperature that accelerates evapo tion, the intensity of which is retained by the decrease of moisture deficit and insolatio The effect of both of the last factors prevails and therefore the intensity of evaporation c creases in spite of the rise of the water temperature. *Subject Headings:* **1. Evaporation fr lakes 2. Temperature influences 3. Poland.**

5.11–140 551.573:551.577.21:551.464(2

*Wüst, G., **Gesetzmässige Wechselbeziehungen zwischen Ozean und Atmosphäre in d zonalen Verteilung von Oberflächensalzgehalt, Verdunstung und Niederschlag.** [Systema alternations between ocean and atmosphere in the zonal distribution of surface salini evaporation and rainfall.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser.* 7:305–328, **1954.** 5 figs., 4 tables, 38 refs. German, English and French summaries p. 30 306. **MH-BH**—New values of precipitation N, evaporation V and salinity S are construc for 5° zones of oceans. $V-N$ is negative N of 40°N, S of 40°S and in 10°N to 0°. Excludi marginal and polar seas there is close parallelism between S and $V-N$, enabling V to calculated by:

N. Hemisphere $V = 66.7(S - 34.47) + N \pm 7$ cm.
S. Hemisphere $V = 80.0(S - 34.92) + N \pm 8$ cm.
For world oceans S is given by $S = 34.69 + 0.137(V - N)$

Subject Headings: **1. Evaporation 2. Precipitation 3. Salinity 4. Oceans.**—*C.E.P.B.*

CONDENSATION

See also: **Physics of rainclouds** (Browne et al), 5.11–26; **Measurement of atmospheric condensation nuclei** (Bider, Verzár), 5.11–47; **Night cooling under clear skies** (Monteith, Saunders), 5.11–110.

5.11–141 551.57

†Aliverti, G., **Untersuchungen über die Flüssigkeitskomponente des atmosphärisc Aerosols.** [Investigations into the liquid component of atmospheric aerosol.] *Archiv Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:252–261, **1954.** fig., 2 tables, 16 r German, English, Italian and French summaries p. 252. **MH-BH**—Sources of natural artificial aerosols are discussed; author concludes that the sea is an important source. describes collection of droplets on a net of very fine threads at places in Italy. At 50% R most frequent size was 0.25–0.5μ and at 83%, 0.5–0.75μ. Numbers of each size per cc of are tabulated, showing a large number even far inland and at 2900 m height. *Subject Headi* **1. Aerosols 2. Saline nuclei.**—*C.E.P.B.*

5.11–142 551.574.1:551.576.1

Day, G. J., **The occurrence of ice crystals in the free atmosphere.** *Meteorological Maga-ne*, London, 83(986):230–231, Aug. **1954.** fig., 7 refs. **DWB**—Frequency of occurrence of ater droplets and ice crystals was determined in 37 flights in clouds not seeded by ice crystals om above. Probability of ice crystals is small between 0 and −12°C, about a half at −12 −18°C and increases rapidly below −18°C (0°F). Thus −18 to −12°C is the highest nge in which Bergeron process would normally be expected. *Subject Heading:* **1. Ice crystals clouds.**—*C.E.P.B.*

5.11–143 551.574.1

Junge, Christian E., **The chemical composition of atmospheric aerosols, I: Measurements Round Hill field station, June–July 1953.** *Journal of Meteorology*, 11(4):323–333, Aug. **954.** 13 figs., 3 tables, 8 refs. **DWB**—Slit collector samples on coast of Massachusetts were alyzed for Cl, Na, SO_4, NH_4 and NO_3 nuclei of 0.08–0.8μ ("large") and 0.8–8μ ("giant"). a and Cl were limited to giant particles and increased logarithmically with Beaufort wind rce. Large particles were almost all SO_4 and NH_4. No NO_2 or ClO_3 and very little Mg as found. Cl increased with approach of a front (S winds) and fell nearly to zero after ssage. In sea fog samples, ratio of Cl to Na was higher than in sea water. *Subject Heading:* **Aerosols.**—*C.E.P.B.*

5.11–144 551.574.1

Lodge, James P.; McDonald, James E. and Baer, Ferdinand, **An investigation of the elander effect.** *Journal of Meteorology*, 11(4):318–322, Aug. **1954.** table, 10 refs. **DWB**—he observations of G. MELANDER (1897) on the apparent production of nuclei from evaporat-g salt solutions (without spray) is examined theoretically. The rate is shown to be in-itesimally small, too slow by a factor of 10^{18} to account for cloud formation. A repetition MELANDER's experiment using a 3% brine solution and a blank control showed no significant fference. MELANDER's result was probably due to contamination. *Subject Headings:* **Saline nuclei 2. Melander effect.**—*C.E.P.B.*

5.11–145 551.574.1

Schaefer, Vincent J., **Final Report,** RL-1007, on Contract Nonr-925(00), with General lectric Research Laboratory, Schenectady, N. Y. Dec. **1953.** 103 p. illus., tables, refs. **WB**—Contents: Falconer, Raymond E., **Correlation between atmospheric electrical activity id the jet stream,** p. 1–29. 14 figs. 7 tables, ref.; Schaefer, Vincent J., **Concentration of ice uclei in passing the summit of Mt. Washington,** p. 31–40. 3 figs., 4 refs.; Schaefer, Vincent J., **e crystals formed spontaneously by the rapid expansion of moist air,** p. 41–50. table, figs., 6 refs.; Schaefer, Vincent J., **Measurement of high concentrations of ice nuclei in a nall parcel of air,** p. 51–58. 3 figs., 7 refs.; Schaefer, Vincent J., **Silver and lead iodides as e-crystal nuclei,** p. 59–67. 3 figs., 6 refs.; Falconer, Raymond E. and Maynard, Kiah, **bjective 30-day forecast method for precipitation and temperature at Albany, New York sing high-pressure-center locations over North America,** p. 69–80. 4 figs., 9 tables, 4 refs.; alconer, Raymond E. and Schaefer, Vincent J., **Observations of the formative stages of the orcester, Massachusetts, tornado,** 89–95. 3 figs., 2 refs.; Falconer, Raymond E., **Possible lationship between the sign of the potential gradient and the type of particles in a cloud,** 97–103. fig., 9 refs. The above reports are combined as a final report of the supplementary ork on Project Cirrus for the year ending July 1, 1953. Several "loose ends" were tied up id the project brought to completion. Some of the papers have been abstracted separately. the second paper, by V. J. SCHAEFER, it was reported that the concentration of ice nuclei −18°C on Mt. Washington, as determined from 15,000 measurements made every 3 hours, ried by a factor of over a million. Maximum concentrations were about 10 particles per and sometimes (at −20°C) there were absolutely none. High counts persist for 6 to 60 urs when air comes from desert regions of the West, especially at times of proximity of jet ream axis. In the fifth paper (by SCHAEFER) it was shown that AgI is superior to lead ide as a freezing nucleus as it is less stable. *Subject Headings:* **1. Project Cirrus 2. Ice ystal nuclei 3. Mt. Washington, N. H. I. Contract NONR-925(00) II. General Electric esearch Laboratory, Schenectady, N. Y.**—*M.R.*

5.11–146 551.574

Twomey, S., **The composition of hygroscopic particles in the atmosphere.** *Journal Meteorology*, 11(4):334–338, Aug. **1954.** 3 figs., 2 tables, 4 refs. **DWB**—Particles $>10^{-12}$ collected on spider webs carried by a light aircraft at 500–10,000 ft over New South Wal in continental and modified maritime air and exposed to an air stream of controlled humidi changed phase at 75%, showing that they were crystals of sea salt. Tests showed no a preciable replacement of chlorides by carbonates. Some nuclei near a town may have be ammonium sulphate. *Subject Heading:* **1. Saline nuclei.**—*C.E.P.B.*

FOG

5.11–147 551.57

Huzioka, Tosio; Tabata, Tadashi and Matsumura, Nobuo, **On the measurement of t water contents in the surroundings of a forest at Akkeshi.** *Tokyo. Forest Experim Station, Bulletin*, No. 64:106–112, Oct. **1953.** 4 figs., 3 tables, 15 refs. In Japanese; Engl summary p. 112. **DWB**—The authors observed the fog water content of air using a recordi fog meter inside and around a forest and arrived at the following results. Fog water conte varied periodically with periods of one or two hours in the open field surrounding the fore Near the top of the forest, noticeable diminution in amplitude and lag in phase were observ in the periodic change of the fog water content. The vertical gradient of fog water conte calculated from its values obtained near the top of the forest at two different heights which w vertically 3 m apart from each other and the vertical eddy diffusivity measured by Ishi and others (about 3×10^4 cm²/sec) gave the quantities of fog water entering the forest throu unit horizontal area at its top. They amounted to 0.4, 0.29 and 0.14 kg/m² hr when the me fog water content observed at the point 3 m above the top of the forest were 420, 220 and mg/m³, respectively. *Subject Headings:* **1. Water content of fog 2. Forest influences 3. A keshi, Japan.**—*Authors' abstract.*

5.11–148 551.57

Kojima, Kenhi and Yamaji, Kenji, **Measurement of the size distribution of fog partic (II).** *Tokyo. Forest Experiment Station, Bulletin*, No. 64:98–103, Oct. **1953.** 2 figs. Japanese; English summary p. 102–103. **DWB**—Fog particles were caught in a thin oil la on a slideglass by a hand-portable device. They were photographed by a microscope a their diameters were measured on the enlarged positive print. The mode of distribution particle diameters, number density of particles and diameter of the largest particles obser at Akkeshi in July and August, 1952, are tabulated in a table together with some other teorological conditions. It was found that almost all fogs were rich in small particles w diameters in the range $0\sim5\mu$ or $5\sim10\mu$. This might be ascribed to the adiabatic cool which takes place in the air mass carrying the fog when it climbs the seashore cliff about 7 high, since during the cooling process a number of minute fog particles will be produced afr intermingled with the particles originally contained in the wind blowing over the sea. T presumption is supported by the fact that fogs showing the dropsize distribution with modes of diameter were at times observed. Fog water content φ was measured at vari heights (0~200 cm above the ground) in the open field covered with grass about 80 cm hi The vertical gradient of water content of fog $(d\varphi/dz)$ at the top of grass multiplied by e diffusivity ν gives the quantity of fog water E carried downwards in an hour by the eddy di sion of air through 1 m² of a horizontal plane lying at the top of the grass. E was found t 64 gr/m² hr when φ at a height of 150 cm above the ground was 253 mg/m³, ν being take 10^3 cm²/sec. This value of E is very close to that directly measured by Ôura at the same ti (For Pt. I, *see item* 4.9–170, Sept. 1953, *MAB.*) *Subject Headings:* **1. Fog formation 2. D size measurement 3. Water content of fog.**—*Authors' abstract.*

5.11–149 551.575.36:551.507.2

*Hartenstein, G. and Markgraf, H. (*German Weather Service*), **Die Nebelverhältnisse Unterelbe im Jahreszehnt 1939–1948.** [Fog conditions of the Lower Elbe during the de 1939–1948.] *Hamburg. Seewetteramt, Einzelveröffentlichungen*, No. 2, March **1952.** 10 tables, 6 figs. **DWB**—Analysis of numerous data on fog frequency at 7 lighthouses a

htships in or near the mouth of the Elbe, during a period (1939–49) when a concerted effort as being made to collect such data. The mean monthly number of days with fog (visibility 1000 m) and of hours with fog, the duration frequencies of fog and the number of hours, ys and months without fog as well as the hourly frequency of fog for each month are tabu-ed. Variation in fog frequency from year to year is also analyzed. *Subject Headings:* **Fog data 2. Fog frequencies 3. Lighthouse observations 4. Lightship observations Elbe River, Germany.**—*M.R.*

CLOUDS

See also: **Duration of convective radar clouds** (Battan), 5.11–25; **Physics of clouds** (Browne et al), 5.11–26; **Diurnal variation of convection** (Bewsey), 5.11–74; **Ice crystals in the free atmosphere** (Day), 5.11–142.

5.11–150 551.576:535.243

Parasol, Matthew (*Inst. for Atomic Res. and Dept. of Chem., Iowa St. Coll.*), **A method for the determination of the compositions and temperatures of stratospheric clouds.** *Journal of Geophysical Research*, 58(2):279, June **1953.** 7 refs. **DWB**—The physical state and temperature of noctilucent clouds (60–90 km) and nacreous or mother-of-pearl clouds (20–30 km) could be determined by obtaining infrared spectrum in the 2–7μ region from an airplane or at high altitude station, since liquid water at $-19°C$ has a strong infrared absorption band at 3μ and a weaker band at $\sim$6.1° and ice at 0°C has a band at 3.0μ and at $-180°C$, 3.22μ. Photographic (rocket or balloon) spectra cannot be used. CO_2 and O_3 interference can be neglected as they have no overlapping bands in the critical region. The temperature of the clouds can be determined from the O-H stretching frequency in the infrared. *Subject Headings:* **1. Stratospheric clouds 2. Spectrophotometry.**—*M.R.*

5.11–151 551.576.1 551.515.3(492)

Feteris, P. J., **Wolkenstraten en een windhoos boven Terschelling.** [Cloud streets and a wind spout over Terschelling.] *Hemmel en Dampkring*, 52(1):3–6, Jan. **1954.** 3 figs., 2 refs. **H-BH**—Description of conditions attending a "cloud street" similar to those described by Orer (*see item* 4.10–195, Oct. 1953, *MAB*) that was observed and photographed (at 9:46 a.m. July 31, 1953). The wind and water spout which also developed over the Terschelling and was photographed at 9:15 a.m. on August 2, 1953. *Subject Headings:* **1. Cloud lanes Waterspouts 3. Terschelling Island, Netherlands.**—*M.R.*

5.11–152 551.576.11:551.501.81

Atlas, David, **The estimation of cloud parameters by radar.** *Journal of Meteorology*, (4):309–317, Aug. **1954.** 4 figs., 3 tables, 21 refs., 7 eqs. **DWB**—The radar reflectivity tor $Z=\Sigma Nd^6$ can give estimates of liquid water content W and median volume diameter d_0 other characteristic diameter) in clouds because of relations between Z, W and d through a flectivity coefficient $G=d_0^{-3}(\Sigma Nd^6/\Sigma Nd^3)$ which increases with spread of drop size and there-e varies with cloud type about a preferred value of 1.35. It is shown that drops $>d_0$ count for about 75% of the reflectivity. A graph is given of icing rate in terms of Z and W m which icing risk may be estimated from Z. An appendix describes a theoretically feasible thod of measuring W by relative attenuation of two wave lengths. *Subject Headings:* **Radar analysis of clouds 2. Icing of aircraft.**—*C.E.P.B.*

5.11–153 551.576.11

*Malkus, Joanne Starr and Ronne, Claude, **Concerning the structure of some cumulus uds which penetrated the high tropical troposphere.** Woods Hole Oceanographic Institution, Contract N6onr-27702 (NR-082-021), Technical Report, No. 27, March **1954.** 38 p. 8 figs., refs. p. 35. **DWB**—Some extremely large oceanic trade-wind cumulonimbus clouds rending upwards of 40,000 ft into a region of strong winds and intense vertical shear have en studied by means of time-lapse photography. A simultaneous still picture of the clouds ken a known distance and direction away from the motion pictures permits triangulation on the clouds and calculation of the vertical and horizontal motions of several of the individual towers. By means of a nearby radiosonde observation, it is established that the

air forming the strongest of these towers must have risen from near cloud base with little no dilution of its buoyancy by mixing with the clear-air surroundings. The model of MALK and SCORER (1954) concerning the erosion of cumulus towers is reviewed and tested up these towers with satisfactory results. A minimum horizontal cloud dimension is apparent required for the production of undiluted towers. The horizontal motion of the clouds relati to the air is also estimated from the model and tested by the observations and the net upwa transport of latent heat in water vapor is calculated approximately. *Subject Headin* **1. Cumulus cloud structure 2. Time lapse photography 3. Cloud models 4. Cloud form tions. I. Woods Hole Oceanographic Institution II. Contract N6onr-27702 (NR-082-02** —*Authors' abstract.*

PRECIPITATION

See also: **Charting heavy rain tracks . . .** (Hartke), 5.11–20; **German Meteorological Yearbook** (Germany), 5.11–30; **Evaluation of cloud seeding—1951/53** (Howell), 5.11–59; **Evaluation of cloud seeding operations—1953** (Howell), 5.11–60; **Evaluation of cloud seeding operations—1952** (Howell), 5.11–61; **Alternations between ocean and atmos. of salinity, evap. and rainfall** (Wüst), 5.11–140; **Statistical investigations of hail frequency . . .** (Bider), 5.11–165.

5.11–154 551.577:54

Dansgaard, W. (*Biophysical Lab., Univ. of Copenhagen*), **The abundance of O^{18} in mospheric water and water vapour.** *Tellus*, Stockholm, 5(4):461–469, Nov. **1953.** 5 fi 2 tables, 17 refs., 19 eqs. **MH-BH**—Investigations into the O^{18}-abundance in the precipitat from a warm front reveal a distinct process of fractionation explainable by the unequal p sures of the saturated vapors of H_2O^{16} and H_2O^{18}. An explanation is given of the low O abundance in glacial waters. A method of experimental investigation into the mechani of the process of precipitation is discussed. *Subject Headings:* **1. Oxygenated water 2. H cipitation mechanism.**—*Author's abstract.*

5.11–155 551.577.1:541.1

Landsberg, Helmut E., **Some observations of the p_H of precipitation elements.** *Ar für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:219–226, **1954.** 3 figs., 5 tab 7 refs. English, German and French summaries p. 219. **MH-BH**—Tests of indivi droplets, snowflakes, etc. made in Boston with p Hydrion papers show values of 3–5.5. D from other authors are compared. No definite variation was found with time in sho or with season, mean p_H increased with increasing rain intensity (drizzle 3.46, heavy rain 4. Mean for liquid precipitation 3.93, solid 4.43, dew 4.3. *Subject Headings:* **1. Precipita composition 2. pH content of rainwater.**—*C.E.P.B.*

5.11–156 551.577.2

Kühn, Udo, **Ein Beitrag zur synoptischen Klimatologie der Starkregen in Sachsen.** contribution to the synoptic climatology of the heavy rains in Saxony.] *Zeitschrift für teorologie*, 7(3):85–92, March **1953.** 7 figs., 20 refs. **MH-BH**—The occurrence of heavy in Saxony is analyzed on the basis of rainfall data for the ten-year period 1934–1939 and 19 1949, and the associated synoptic conditions. Heavy rain is defined as a daily rainfall of less than 15 mm/day. It is shown that the number of days with heavy rain and the amo of rainfall show regional and seasonal variations. Synoptic analysis revealed that the posi of the low pressure distribution as well as the V_b and V_b-like situations, and not merely st are responsible for the heavy summer rainfall. During the winter months and during transition periods the heavy rainfall is due to the northwest situation, north situation regular west and northwest situation. In numerous instances, especially during flat pressure distribution, stable stratification prevails during heavy rainfall. *Subject Head* **1. Rainfall extremes 2. Synoptic analysis 3. Synoptic conditions for rainfall 4. Sax** —*I.L.D.*

5.11–157 551.577.2

Moniak, J., **Opady obszaru delty Wisły w aspekcie gespodarczym.** [Rainfall o Vistula delta area and its economic aspect.] *Czasopismo Geograficzne*, Wroclaw, 21/22

59–473, 1952. 11 figs., 42 refs. **DLC**—This is a detailed study of the rainfall distribution n the area as to its quantity, territory covered and time of occurrence based on data published y the Staatliches Observatorium of Danzig in 1938 for the period 1921–1937. It shows nat: 1) the greatest quantity of rain comes from the western sector; 2) the smaller amount of recipitation (as compared to other parts of the country)—470 to 600 mm—is compensated or by a higher relative humidity of the air; 3) the deciding factor in the quantitative rainfall istribution is the enclosing of the delta on the west by mountains which together with winds lowing from diverse directions give a peculiar outline to the isohyets; a smaller amount of recipitation as compared with adjacent areas results and 4) that the influence of the Atlantic cean on precipitation is greater than the effect of the Baltic Sea. A series of graphs and ables illustrate the paper. *Subject Headings:* **1. Rainfall distribution 2. Long period records . Vistula River, Poland.**—*A.M.P.*

5.11–158 551.577.3(234.3)

Steinhäusser, H., **Die Veränderlichkeit des Niederschlags in den Alpen.** [Variability of recipitation in the Alps.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,* (1/2):54–59, **1954.** fig., table, 4 refs., 4 eqs. German, English and French summaries p. 54. **WB**—Writing v_a for mean absolute variability of annual rainfall and $v_r = 100\ v_a/N$, Conrad 1932) found for world in general

$$v_a = 36 + 0.13\ N \qquad v_r = \frac{3600}{N+60} + 13$$

uthor compares observed values of v_a and v_r at Alpine stations with those calculated from ese expressions and plots the differences. *Subject Headings:* **1. Precipitation variations Alps.**—*C.E.P.B.*

5.11–159 551.577.36:551.501.45:519.241

Schneider-Carius, K., **Der Wirkungszuwachs in statistischer Betrachtung.** [The law of owth in statistical studies.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,* (1/2):22–35, **1954.** 4 figs., 5 refs. German, English and French summaries p. 22–23. **DWB**—Frequency distributions of some meteorological elements are best made by equal steps, hers (autochthonic) by steps increasing logarithmically. As an example of the latter, daily infall probability in Central Europe is analyzed into two Gaussian distributions by method O. Essenwanger. The problem of a boundary at zero is examined. Meteorological bservations are then regarded as a series resulting from a continuous process, which may act iformly, leading to values normally distributed about a mean; or proportionally to existing alue, leading to exponential growth. *Subject Headings:* **1. Precipitation frequencies 2. Statical studies.**—*C.E.P.B.*

5.11–160 551.577.37(899)

*Tiscornia, José, **Las lluvias en el Uruguay estudiadas desde el punta de vista de su tensidad y las consecuencias agrícolas pertinentes.** [Rainfall intensity in Uruguay and its fects on agriculture.] *Revista Meteorologica,* Montevideo, 12(44/45):22–37, June/Dec. **1953.** gs. **MH-BH**—A table of annual percentage frequencies of intense, very intense and torrential ins and one of monthly percentage of rainfall exceeding 100 mm are presented. They are ased on records obtained at various stations in Uruguay during the period 1931–1950. The oblem of soil erosion as a function of rainfall intensity and duration is discussed (Lyon and uckman). Of the total precipitation in Uruguay, 32% is found to be harmful as to erosion. *ubject Headings:* **1. Rainfall intensities 2. Uruguay.**—*G.T.*

SNOW AND HAIL

See also: **Runoff evaluation of cloud seeding** (Howell), 5.11–62; **Heat of evaporization . . . of solution suspended in atmosphere,** (Dufour), 5.11–137.

5.11–161 551.578.41

Bossolasco, Mario, **Newly fallen snow and air temperature.** *Nature,* London, 174(4425): 2–363, Aug. 21, **1954.** fig., 3 refs. **DWB**—Observations near Davos showed that density

of newly fallen snow depends on mean air temperature during fall, reaching a minimum about 0.08 at −11°C with a secondary minimum near −4°C. The minimum near −11 is explained by change to stellar form. *Subject Heading:* **1. Snow density.**—*C.E.P.B.*

5.11–162 551.57

Lauscher, F., **Klimatologische Probleme des festen Niederschlags.** [Climatologi problem of solid precipitation.] *Archiv für Meteorologie, Geophysik und Bioklimatolog Ser. B*, 6(1/2):60–65, **1954.** 2 figs., table, 6 refs., eq. German, English and French summar p. 60–61. **DWB**—A rough relation between % F of total precipitation which falls in so form and mean temperature t°C is $F=50-5t$. This is examined for E. Alps, S. Norway a Arctic. Monthly figures give fairly good results. Using annual mean temperature, mount stations reach $F=100\%$ at −8°C, but normally sited stations reach 80% at −10°C and th decrease again (figures for pack ice). *Subject Heading:* **1. Snow.**—*C.E.P.B.*

5.11–163 551.578.42 (427

Reynolds, G., **Snowfall probabilities on Merseyside.** *Royal Meteorological Socie Quarterly Journal*, 80(345):444–447, July **1954.** fig., 4 tables, 4 refs. **DWB**—Numbers days of snowfall and snow lying at Bidston, Liverpool, are computed for 1920–1953. F quency curves are fitted to monthly totals. Probabilities of heavy snowfall and of deep sn lying are tabulated. *Subject Headings:* **1. Snowfall data 2. Liverpool, England.**—*C.E.P.B*

5.11–164 551.578

§Fulks, J. R. (*U. S. W. B., Wash., D. C.*), **The early November snowstorm of 1953.** *Wea erwise*, 7(1):12–16, Feb. **1954.** figs. **MH-BH**—An unusual storm during which over 15 of snow fell in a belt 30 mi wide in central Pennsylvania and western New York, and more t one in. all over Virginia and states to the north and east. This is one of earliest snowsto on record (Nov. 6–7, 1953) in this region. Synoptic history of storm portrayed in cha and text and attending damage cited. Isopleths of snow depth shown on chart. Gale 70–98 mph occurred on coast and damage was caused by high water resulting from onsh winds and high tides. *Subject Headings:* **1. Snowstorm in eastern U. S. (Nov. 6–7, 19 2. Storm tides 3. Pennsylvania 4. Northeastern States.**—*M.R.*

5.11–165 551.578.72:551.577.3 (4

*Bider, M., **Statistische Untersuchungen über die Hagelhäufigkeit in der Schweiz ihre Beziehungen zur Grosswetterlage.** [Statistical investigations of hail frequency Switzerland and its relation to the general weather situation.] *Archiv für Meteorol Geophysik und Bioklimatologie, Ser. B*, 6(1,2):66–90, **1954.** 6 figs., 11 tables, 8 refs. Germ English and French summaries p. 66–67. **DWB**—Ten-year sums of number of days w hail in Switzerland, and their S.D. are given for 9 stations; annual frequency is plotted. surance claim statistics are given by districts. Annual variation is set out. Frequenc then related to the various general synoptic situations, depression and trough types giving greatest probability. Pressure is generally below normal and falling; dew point well all normal. *Subject Headings:* **1. Hail statistics 2. Switzerland.**—*C.E.P.B.*

HYDROMETEOROLOGY

See also: **Lysimeter observations—water balance** (Kalweit), 5.11–138.

5.11–166 551.579 (

*Chow, Ven-te, **Hydrologic studies of urban watersheds; rainfall and runoff of Bone Creek, Champaign-Urbana, Illinois.** *Illinois. University. Dept. of Civil Engine Civil Engineering Studies; Hydraulic Engineering Series*, No. 2, Nov. 1, 1952. 66 p. 15 13 tables, bibliog. refs. throughout. **DWB**—A monograph on urban hydrology. Catch area (4.45 sq mi) roughly coincides with the town of Champaign; impervious area—3 Study of hydrologic cycle based on 14 rain gages at a stream gaging station established in Maximum rainfall of different duration given for each year of the period 1916–50. D duration frequency curves constructed and areal distribution of storms studied. Unit hy

graph and ground water depletion curves derived. Annual evapotranspiration (two years of observation) was found to be 20.0″. *Subject Headings:* **1. Urban hydrology 2. Hydrologic cycle 3. Rainfall intensities 4. Champaign, Ill.**—*A.A.*

5.11–167 551.579(43):551.573

*Kalweit, Heino, **Beitrag zum Gebietsverhalten der Verdunstung in mitteldeutschen Landschaften.** [Contribution to regional evaporation in central Germany.] *Zeitschrift für Meteorologie*, 7(12):373–380, Dec. **1953.** 5 figs., 4 tables, 8 refs. **DWB**—Data presented for annual precipitation (N), runoff (A), evapotranspiration (V) and temperature. A linear relation between V, N and the saturation deficit (S) is proposed and a second order algebraic equation between V and N given. Coefficients are given for the separate computation of the apparent evapotranspiration in winter and summer on the basis of the precipitation in the given and the preceding half-year. More precise, but entirely empirical, relations are derived for the computation of monthly evapotranspiration utilizing the saturation deficit. *Subject Headings:* **1. Hydrologic cycle 2. Evapotranspiration 3. Central Germany.**—*A.A.*

5.11–168 551.579:551.573(489)

Lyshede, J. M., **Evapotranspiration from areas in North Seeland.** *International Union of Geodesy and Geophysics. Association of Scientific Hydrology, Brussels*, **1951,** [*Transactions*], 3:463–467. pub. 1952. 4 figs. **DWB**—By careful consideration of underground catchment area of two water supply areas (located near Roskilde) for Copenhagen, the annual evapotranspiration was found to be about 260 mm. *Subject Headings:* **1. Hydrologic cycle 2. Evapotranspiration 3. North Seeland, Denmark.**—*A.A.*

5.11–169 551.579(438)

*Poland. Państwowy Instytut Hydrologiczno-Meteorologiczny, **Stosunki opadu i odpływu w dorzeczu Wisly w latach 1921–1937.** [Relations between precipitation and runoff in the Vistula basin during 1921–1937.] Its *Prace*, No. 22, **1951,** *Materialy do Bilansu Wodnego Polski*, Pt. 4. 59 p. 14 figs., 5 tables. **DLC**—Contains 5 series of tables showing monthly, semiannual and annual amounts of: 1) accumulated discharge (millions of m^3); 2) average discharge (m^3 sec^{-1}); 3) runoff height (mm) and 4) precipitation and runoff height, water loss and runoff coefficients for 15 catchment areas of the Vistula River. A map of the area as well as a control diagram of the river discharge in longitudinal section for Jan., Feb., March and April 1921 are added. *Subject Headings:* **1. Hydrologic cycle 2. Runoff 3. Vistula River, Poland.**—*A.M.P.*

5.11–170 551.579:551.573(481)

Soegnen, R., **Indirect computation of real precipitation and evaporation.** *I.U.G.G. Association of Scientific Hydrology, Brussels*, **1951,** [*Transactions*], 3:468–472. pub. 1952. fig., tables. **DWB**—Author assumes that $L=\frac{SP_a}{P_w}-R$. L—annual water loss from evapotranspiration and change in storage; P_a/P_w—ratio between annual and winter precipitation, measured at a meteorological station, usually located in a valley and S—mean water content of accumulated snow, computed on the basis of a snow course and adjusted for losses from evaporation and occasional melting. As a sample the water balance of the Aursunden River basin is discussed, giving data for mean conditions and also the water content of snow for single winters from 1928 to 1947. The seasonal retention is computed. *Subject Headings:* **1. Hydrologic cycle 2. Aursunden Catchment, Norway 3. Norway.**—*A.A.*

5.11–171 551.579(68)

*South Africa. Dept. of Irrigation, **Report on the relationship between rainfall and the resulting runoff of certain South African Rivers.** *I.U.G.G. Association of Scientific Hydrology, Brussels*, **1951,** [*Transactions*], 3:221–225. pub. 1952. 4 tables. **DWB**—A good source of data for a general study of hydroclimatic conditions in South Africa. Report presents annual values of rainfall and runoff for 73 rivers, giving area and geographical conditions for each river basin. Thirteen regions are selected according to topography and climatic conditions

(summer rain, rain days, etc.). Annual data for 30 single years given for the Vaal River. *Subject Headings:* **1. Hydroclimatic data 2. Hydrologic cycle 3. Union of South Africa 4. Vaal River, South Africa.**—*A.A.*

5.11–172 551.579.

Tonini, Dino, **Sur les correlations entre precipitations neigeuses et debits d'un cours d'eau typique.** [Correlation between the snow precipitation and the discharge of a typical water course.] *I.U.G.G. Association of Scientific Hydrology, Brussels*, **1951,** [*Transactions*], 1:322–329. pub. 1952. 6 figs., table, 9 refs. **DWB**—The study deals with the Ansie catchment area. The author shows how to utilize the hypsometric curve in order to computh the percentage of the area covered by snow, and the mean temperature of the area with abovh freezing temperatures. The relation between temperature lapse rate and mean temperatur is shown, and the recession curve for the river is computed. Temperature, precipitation an discharge data are given for each snow accumulation and melting period for the years 1927–44 On the average, 47% of the accumulated snow water content runs off. *Subject Headings:* **1. Snow melt runoff 2. Snow cover 3. Mountain hydrology 4. Ansiei Catchment, Italy.**—*A.A.*

5.11–173 551.579.2:551.524:551.50

U. S. Corps of Engineers and U. S. Weather Bureau, **Empirical methods of estimating snow melt runoff from air temperature.** *U. S. Corps of Engineers and U. S. Weather Bureau Cooperative Snow Investigations, Technical Report*, No. 16, Interim Report No. 2, Dec. **1949** 5 p. tables, graphs. **DWB**—Using runoff and temperature data obtained at the Cast Creek Basin, Central Sierra Snow Laboratory for the 1946 melting season, an empirical metho (amply illustrated in graphs) was worked out for estimating runoff and was applied durin the 1949–50 seasons. Heat supply was represented as the sum of weighted means of anteceden daily maximum and minimum surface air temperatures, and the accumulated runoff fro snow melt as the percentage of total seasonal runoff. *Subject Headings:* **1. Snow melt 2. Run off forecasting 3. Temperature-runoff relations. I. Central Sierra Snow Laboratory.**—*M.*

5.11–174 551.579.2:551.52

Zingg, Th., **Beziehung zwischen Temperatur und Schmelzwasser und ihre Bedeutun für Niederschlags- und Abflussfragen.** [Relation between temperature and melt wat and their significance for the problem of precipitation and runoff.] *I.U.G.G. Associatio of Scientific Hydrology, Brussels*, **1951,** [*Transactions*], 1:266–269. pub. 1952. 4 fig French summary p. 266. **DWB**—Recording snow melt runoff (A) from a 5m² horizont surface, it was found that $A = 4.5T$; T—total of positive daily mean temperatures. Th agreement with measured values is so close, that the formula is suggested for the estimatio of winter precipitation. The height dependence of cumulative temperatures and their us studying glacier variations, is shown. *Subject Headings:* **1. Snow melt runoff 2. Cumulati temperatures 3. Switzerland.**—*A.A.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See also: **The English climate** (Brooks), 5.11–1; **Climatology** (Kostin, Pokrovskaia), 5.11–5; **Climates of North America** (Vivitskii), 5.11–9.

5.11–175 551.58:631

Ganssen, Robert, **Zur neueren Entwicklung der Bodenkunde.** [On new developmen of soil science.] *Forschungen und Fortschritte*, Berlin, 28(7):201–204, July **1954.** 10 re **DWB**—Soil results from the complex interaction of climate, mother rock, relief and life, which climate is generally the most important. In recent years a "climatic soil scienc has developed in U.S.A. and U.S.S.R. In smaller areas relief is important both directly a by governing local climate. Ground water decides the movement of soluble constituen

In Europe human activities have transformed the natural soil. The science of manuring is discussed. Finally, a general summary of the principles of soil science is given. *Subject Headings:* **1. Agricultural climatology 2. Soil science.**—*C.E.P.B.*

5.11–176 551.58

Gumiński, Romuald, **Jednorodność materiału obserwacyjnego—podstawowy warunek opracowań klimatologicznych!** [Uniformity of observational material—the fundamental condition of climatological analyses!] *Gazeta Obserwatora PIHM*, Warsaw, 4(6):1–3, June **1951.** tables. **DLC**—Complete uniformity of observational material on individual elements of climate such as data of air temperature, humidity, precipitation, etc. is indispensable. It is shown by examples that precise analyses are incomplete and often erratic if this condition is not strictly maintained. *Subject Headings:* **1. Observational data uniformity 2. Synoptic analysis.** —*A.M.P.*

5.11–177 551.58:63(43)

Seyfert, Franz, **Die klimatischen Voraussetzungen des Zwischenfruchtanbaues nach Winterroggen und Winterraps in der Deutschen Demokratischen Republik unter Berücksichtigung von biologischen und Bodenfaktoren.** [The climatic basis of catch crops after winter rye and winter rape in the German Democratic Republic with regard to biological and soil factors.] *Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, Abhandlungen*, 4, No. 25, **1954.** 36 p. 3 figs., 12 charts, 6 tables, 37 refs. **DWB**—The end of the annual vegetation period is taken as the average date of leaf coloration of the trees, which occurs when the mean daily temperature falls below about 10°C. The catch crop period is the time between this and the harvesting of the green crops. Up to 300 m its length is 75–84 days after rye and 95–99 days after rape, depending mainly on soil; it decreases by 4 days per 100 m after rye and 2 days after rape. The main factor is the amount and reliability of rainfall. Fold. charts show duration of catch crop season after rye and after rape (mean 1947–51 and separate years) and mean rainfall 1891–1930 and rainfall reliability 1947–51 for various months and groups of months. The best region is in the north (except for a 30 km coastal strip), the least favorable eastern Thuringia. At higher levels catch crops are only possible after rape. *Subject Headings:* **1. Agricultural climatology 2. Germany.** —*C.E.P.B.*

CLIMATE OF PARTICULAR PLACES

See also: **Climates of North America** (Vivitskii), 5.11–9; **Climatic soil types in tropical Columbia** (Schaufelberger), 5.11–192.

5.11–178 551.582.1(425)

Saward, Beatrice (*Geogr. Univ. of Birmingham, Eng.*), **Climate.** Birmingham, Buchter & Webb, [1951?] 10 p. figs., refs. Reprinted from: "Birmingham and its regional setting." A scientific survey, 1950. **DWB**—Brief but analytical description of the wind, precipitation, temperature, fog and haze, sunshine, thunderstorm and hail conditions of the Birmingham area of England. Frequencies of winds from various rhumbs (1936–45), of monthly rainfall totals (1891–1944) and of mean monthly temperature (1891–1949) shown in detailed graphs. Isohyetal chart and topographic profile show local variations in the 40×50 mile area which is considered. Elevations vary from 100 ft to 750 ft. Average annual precipitation from 22 to 35 in. The highest totals occur on the highest ridges, generally. *Subject Headings:* **1. Climatology 2. Birmingham Region, England.**—*M.R.*

5.11–179 551.582.2:634.3(72)

*Burke, J. Henry (*Marketing specialist, U. S. Agric. Dept.*), **Changes in Mexico's citrus industry.** *U. S. Dept. of Agriculture. Foreign Agriculture Report*, No. 70, Jan. **1953.** 127 p. 45 tables, numerous photos. **DWB**—This report concerned chiefly with the economics of the citrus industry includes tables of monthly mean, maximum and minimum temperature, humidity, rainfall and days with frost for Colima (page 40), Apatzingan (p. 46), Veracruz, Cordoba and Jalapa (p. 59), Atotolnico El Alto (p. 83), Rio Verde (p. 92), Victoria (p. 99)

and Linares and Montemorelos (p. 112). Most of the tables represent means for the period 1931–1940. *Subject Headings:* **1. Climatic data 2. Citrus fruits 3. Frost data 4. Mexico** —*G.T.*

5.11–180 551.582.2(02)(63

*Ethiopia. Ministry of Commerce and Industry, **Economic handbook of Ethiopia.** Addis Ababa, Berhanenna Selam Printing Press, **1951.** 212 p. fig., numerous tables. **DLC**—This statistical handbook contains the general information useful for a businessman or a tourist in Ethiopia. The climatological data are presented in tables showing average temperature °F, humidity, rainfall in inches, and days of rain for the four important cities: Addis Ababa (7740 f.a.s.), Harar (6600 f.a.s.), Gondar (6700 f.a.s.) and Timma (5500 f.a.s.). More detailed tables give temperature °C (average and absolute maximum and minimum), cloudiness, wind direction and rainfall in mm (maximum in 24 hours) for Addis Ababa for each month 1947–1949. Wind direction frequency is given for 6 stations for each month and annual summaries for 5 stations. Average rainfall data in mm for each month are given for 24 stations and data on temperature and average cloudiness (tenths) are given for 7 stations. *Subject Headings:* **1. Climatic data 2. Climate of Ethiopia 3. Handbooks 4. Ethiopia.**—*W.N.*

5.11–181 551.582.2:629.13(43

*Germany. Deutscher Wetterdienst in der US-Zone, **Flugklimatologische Tabellen deutscher Flugplätze.** [Aero-climatological tables of German airports.] Bad Kissingen **1952.** 9 p. numerous tables, 10 refs. Mimeo. **DWB**—Tables are presented *in extenso* according to ICAO, (DOC 7144-MET 521) regulations, for Berlin, Bremen, Stuttgart, Nuremberg, Rhein-Main and Munich airports for 1949–52 for each of the 24 hours for each month and season. The elements tabulated are visibility, ceiling height, wind direction and speed for various categories, and combinations of the above elements. *Subject Headings:* **1. Airport climatic data 2. Ceiling and visibility data 3. Germany. I. Guss, Hans** (*ed.*).—*M.R.*

5.11–182 551.582.2(689.7

*Hornby, A. J. W. (*Asst. Dir. Agri.*), **Climate of central Nyasaland.** *Nyasaland. Dept. of Agriculture, Bulletin, New Ser.*, No. 9, Dec. **1933.** 22 p. 10 tables, 2 diagrs. (fold.). **DWB**—A concise discussion of the climatic characteristics, especially as affecting agriculture, of Nyasaland and a comparison of the general features of the climate with those in other parts of the world (China, India, Argentina, Virginia, etc.) where similar crops are grown. Average and extreme monthly values of the usual elements including relative humidity, cloudiness, earth temperatures at 1 ft and 4 ft, and wind direction (frequencies) are tabulated. Driest and wettest season or period in each month at Zomba and intensity frequencies of rainfall for 6 stations are also tabulated. Chart shows mean annual temperatures. Data cover period 1892–1932 but are not uniform. *Subject Headings:* **1. Climatic data 2. Climate of Nyasaland 3. Nyasaland.**—*M.R.*

CLIMATIC CHANGES

See also: **Solar variation and climatic changes** (Bell), 5.11–99; **Agric. production in Finland** (Hustich), 5.11–200.

5.11–183 551.58

†Shapley, Harlow (*ed.*) (*Harvard Univ.*), **Climatic change: evidence, causes, and effects.** Cambridge, Mass., Harvard Univ. Press, **1953.** 318 p. numerous figs. and tables, bibliog. at end of each ch. Price: $6.00. **DLC**—The twenty-two papers constituting this book were delivered originally at a conference on climatic change and climate and life held at the American Academy of Arts and Sciences in Boston in May 1952. These contributions can be classified into the following broad fields: astronomy (6), geology and geography (3), meteorology (4), paleontology (4), paleoanthropology (2), geophysics (1), geochemistry (1) and a general paper by the editor summarizing the various papers and discussing the origin of life and the conditions for its appearance and existence. Each of these papers will be abstracted separately. *Subject Headings:* **1. Climatic changes 2. Climate and man.**—*I.L.D.*

5.11–184 551.583.14(485)

Wallén, C. C. and Ahlmann, Hans W:son, **Some recent studies in Sweden on the present climatic fluctuation.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,* 6(1/2): 1–21, **1954.** 8 figs., 10 refs. English, German and French summaries p. 7–9. **DWB**—Ten-year and 30-year moving averages of air temperature for stations in Sweden show in Jan. a decrease since 1938, even after allowing for a few exceptionally cold winters. July temperature has been rising since 1915 and the rise continues, though more slowly. Since 1901 annual amplitude has increased continuously. In the north Jan. cooling is most marked and July is becoming cooler. Ice formation on Swedish coasts became progressively later in autumn up to 1939, then earlier. Date of breakup still shows a slight tendency to be earlier. *Subject Headings:* **1. Climatic trends 2. Sweden.**—*C.E.P.B.*

5.11–185 551.583.2(52)

Arakawa, H., **Fujiwhara on five centuries of freezing dates of Lake Suwa in the Central Japan.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,* 6(1/2):152–166, **1954.** 3 figs., 5 tables, 5 refs. English, German and French summaries p. 152. **DWB**—Dates of freezing of this shallow lake and of formation of pressure ridges (omiwatari) by expansion and contraction of ice are given from 1397–1954 as an index of severity of winter. From 1444–1700 winters were much more severe than in 1701–date. K. YAMAGAWA's measurements of annual growth rings of Japanese cypress 70–90 km from the lake are also quoted for 1109–1920. *Subject Headings:* **1. Historical climates 2. Freezing of lakes 3. Tree ring growth 4. Japan. I. Fujiwhara, Sakuhei II. Yamagawa, K.**—*C.E.P.B.*

MICROCLIMATOLOGY

See also: **Quarterly summary of observ. made at Seabrook, N. J.** (Johns Hopkins Univ.), 5.11–114.

5.11–186 551.584:595.7

Henson, W. R. (Agri. Dept., Canada) and Shepherd, R. F., **The effects of radiation on the habitat temperatures of the lodgepole needle miner, Recurraria Milleri Busck (Gelechiidae: Lepidoptera),** *Canadian Journal of Zoology,* Ottawa, 30:144–153, April **1952.** 4 tables, fig., 4 refs. **DLC**—Also in: *Canada. Dept. of Agriculture. Div. of Forest Biology. Contribution,* No. 30.—The relationship between the habitat temperatures of the lodgepole needle miner and the temperature of the ambient air, radiation and cloudiness was investigated by measuring the needle mine temperatures with a copper-constantan thermocouple, the contemporaneous ambient air temperature with a sling psychrometer and the radiation with a radiation meter. At each level of radiation the mine temperatures varied with exposure, orientation of the needles to the source of radiation, color and size of cross-section of the mine and wind. The relationship between amount of mine heating and radiation is linear and regular. At any constant level of radiation, the distribution of radiation levels around a tree is regular. It was possible to predict needle mine temperatures from radiation data. On clear nights the mine temperatures fell below air temperature, but were somewhat higher on clouded nights. *Subject Headings:* **1. Insect microclimatology 2. Lodgepole needle miner.**—*I.L.D.*

5.11–187 551.584(52)

*Takeda, Kyoichi; Inoue, Katura and Ohta, Iwao, **Micro-climatic observations at an unsuccessful plantation on the SSE-slope of Mt. Fuji.** *Tokyo. Forest Experiment Station, Bulletin,* No. 65:11–19, Oct. **1953.** 4 figs. In Japanese; English summary p. 19. **DWB**—Data on maximum and minimum temperatures (Oct. 15–29, 1948) observed at nine locations in and around a forest plantation on Mt. Fuji (1450 m) are presented in graphs, identifying the site as a frost pocket. Pressure charts for East Asia are presented for each day of measurement. *Subject Headings:* **1. Micrometeorological data 2. Frost pockets 3. Mt. Fuji, Japan.**—*G.T.*

5.11–188 551.584:551.525

*Vásárhelyi, József, **A kukorica öntözésének hatása a mikroklímára.** [Microclimatic effect of the irrigation of corn.] *Agrártudomány,* Budapest, 5(7):201–206, July **1953.** 12

figs., table, 5 refs. **DLC**—Soil temperature measurements were made at surface, 2 cm an 5 cm in (a) an irrigated corn field, (b) a non-irrigated corn field and (c) an open field durin the growing and ripening period of corn (summer 1951). Comparative curves of the dail march of soil temperature at different stages of plant development are presented for the thre fields. *Subject Headings:* **1. Soil temperatures 2. Microclimatic data.**—*G.T.*

5.11–189 551.584.31:551.524.

Tsuboi, Y. (*Natl. Inst. of Agri. Sci., Tokyo*), **Study on the distribution of air temperatur in winter on the sloping field.** *Journal of Agricultural Meteorology*, Tokyo, 7(3/4):87–8 Nov. **1952.** 3 figs. In Japanese; English summary p. 89. **MH-BH**—Temperature dis tributions on the northeastern (very gentle) slope of the Konosu Experiment Farm wer investigated during the winter 1948–49. The diurnal movement of temperature stratificatio along the slope and minimum temperature distribution at heights of 10, 100 and 150 cm abov the ground are shown. *Subject Headings:* **1. Temperature distribution 2. Topographic effect 3. Konosu Experiment Farm, Japan.**—*From author's abstract.*

CLIMATIC CLASSIFICATION

See also: **Soil temp. in S. Carolina** (Greene), 5.11–115.

5.11–190 551.58

Fel'dman, IA. I. and CHubukov, L. A., **Klimat v pogodakh.** [Climate in the weather *Priroda*, Moscow, No. 10:42–48, Oct. **1953.** 2 figs., graphs. **DLC**—A discussion of the metho of "complex climatology" which was developed initially by E. F. FEDOROV and which is base upon the 24 hour pattern of meteorological elements and phenomena as a unit of weather an the establishment of weather types based upon the magnitudes of meteorological variable and weather phenomena and the frequency of weather types over a given time interva Using this method, the authors establish for the U.S.S.R. dry wind-drought weather, modera drought weather, moderately cloudy—no drought weather, weather with night cloudines weather with diurnal cloudiness, rainy weather, humid tropical weather and frost weathe These are all described in detail and types of climate are described by means of these weath types. The climatic types representing the forest zone, subtropical zone, high mountain zon desert oasis and dry steppe are shown graphically. *Subject Headings:* **1. Climatic classification 2. Climatic types 3. U.S.S.R. I. Federov, E. F.**—*I.L.D.*

5.11–191 551.585:631.4

Schaufelberger, P. (*Chinchiná*), **Ist der Tschernosem ein zonaler Klimabodentyp?** [chernozem a zonal climatic soil type?] Experientia, 10(6):242–245, June 15, **1954.** 3 table 8 refs. English summary p. 245. **DLC**—Chernozem or "black earth" is generally treele and characterized by downward transport of lime. A soil type with these characteristics found in many climatic types from semiarid to humid. In U.S.A. and Columbia the zon run north–south, in Europe east–west. They require a base-rich mother rock; the blac color is due to occasional saturation. Chernozem is a hydrolith soil, not a climatic soil typ *Subject Headings:* **1. Soil types 2. Chernozem.**—*C.E.P.B.*

5.11–192 551.585:631.42 551.582.2(8

*Schaufelberger, P., **Die Klimabodentypen des tropischen Kolumbiens.** [Climatic so types of tropical Colombia.] *Naturforschende Gesellschaft in Zürich, Vierteljahresschri* 97(2):92–114, June 30, **1952.** tables, 10 refs. **DWB.** Also: **Die nicht zonalen Bodentype des tropischen Kolumbiens.** [The non-zonal soil types of tropical Colombia.] *Ibid.*, 98(2 86–108, June 30, **1953.** 18 tables, bibliog. p. 108. **DLC**—The first article gives month temperature and precipitation data for a large number of stations. Chemically analyzed so profiles (pH, humus content, etc.), selected from 1400 samples, are given for five vegetati zones and compared with climatic conditions, topography, etc. Results discussed accordi to Lang's classification of soil types computing the annual rainfall index $R = P/t$; P—precipit tion (mm), t—temperature (C°). The second article discusses soil types for which the effect climate is only of secondary importance. *Subject Headings:* **1. Soil types 2. pH content of s 3. Climatic data 4. Colombia.**—*A.A.*

BIOCLIMATOLOGY

5.11–193 551.586:59

Suzuki, S.; Tanioka, K.; Uchimura, S. and Marumoto, T. (*Training School of Met. Observers, Japan*), **The hovering height of skylarks.** *Journal of Agricultural Meteorology*, Tokyo, 7(3/4):149–151, Nov. **1952.** 3 figs., 2 tables, ref. In Japanese; English summary p. 151. **MH-BH**—Data on the height selected by soaring skylarks and on associated meteorological conditions are presented. It appears that the regular soaring height (80–100 m) is not affected by any weather factor as long as the temperature ranges between 20 and 28°C and wind velocity is within 5 m/sec. Over the Kurile Islands, skylarks usually fly at a height scarcely exceeding 20 m, which may be attributed to low temperatures prevailing there. *Subject Heading:* **1. Soaring of birds.**—*G.T.*

5.11–194 551.586:595.7

Badami, R. V., **Indian weather and locust immigration in India.** *Science and Culture*, Calcutta, 15(12):467–468, June **1950.** table. **DLC**—In June locusts migrate from Persia to the desert area of Rajputana, India; they migrate back to Persia in Oct. A table of normal monthly rainfall and rainy days at 6 stations in Iraq and 5 in Rajputana is presented on the basis of data for the period 1934–1937. It appears from the data that locust migration is governed by the rainfall cycle, namely that they migrate "from one desert region of maximum rainfall in the winter to another with maximum rainfall in the summer." *Subject Headings:* **1. Insect migrations 2. Locusts 3. India.**—*G.T.*

5.11–195 551.586:595.7

Nordman, Adolf Fr. (*Zoological Museum, Helsinki*), **Significance for insects of climatic changes.** *Fennia*, Helsinki, No. 75:61–68, **1952.** 2 figs., refs. **DWB**—The author analyzes temperature, precipitation and hydrological conditions favorable for different species of insects. A number of cases is described where extreme weather conditions resulted in a complete disappearance of certain insects. *Subject Headings:* **1. Ecoclimatology 2. Insect ecology 3. Climatic variations 4. Finland.**—*A.A.*

5.11–196 551.586:595.7

Wilski, A., **Wpływ czynników klimatiycznych na występowanie owadów—szkodników roślin.** [Influence of climatic factors upon the appearance of gadflies—plant pests.] *Gazeta Obserwatora PIHM*, Warsaw, 4(8):8–10, Aug. **1951. DLC**—Although it is widely known that climatic conditions have a far reaching influence on the appearance of gadflies, information concerning the interdependency between these two phenomena is meager. The author presents an analysis of the four most important climatic factors affecting in a greater or lesser degree the growth and development of these plant pests, namely: temperature, humidity, wind and light. *Subject Headings:* **1. Insect ecology 2. Bioclimatology.**—*A.M.P.*

5.11–197 551.586:598.2

†Eyster, Marschall B., **Quantitative measurement of the influence of photo-period, temperature, and season on the activity of captive songbirds.** *Ecological Monographs*, 24(1):1–28, Jan. **1954.** 18 figs., refs. p. 26–28. **DLC**—Various species of sparrows show varying responses to temperature, daylight, food, etc. Controlled experiments described and illustrated graphically in this monograph, show that domestic sparrows (non-migratory) do not respond as strongly as migratory species, such as the white-throated or white-crowned sparrow or the slate colored junco. Some species show nocturnal unrest during migratory period. Effect of temperature varied but the white-throated sparrow shows progressive increase in activity from −14°C to 23°C. *Subject Headings:* **1. Photoperiodism of birds 2. Temperature effects on birds 3. Sparrows.**—*M.R*

5.11–198 551.586:63

Németh, László, **Méhészet és a meteorológia.** [Apiculture and meteorology.] *Időjárás*, 56(5/6):186–187, May/June **1952. DWB**—Ambulant apiculture is practiced in Hungary by about 3,000 beekeepers with some 30,000 hives. After the blooming season, the bees are transferred from one locality to another, where melliferous flowers can still be found. Un-

expected frost or other unfavorable meteorological conditions prevailing in the areas reache at great expense frequently frustrate the hopes of apiarists. The author therefore suggest the establishment of temporary observation stations in the appropriate regions and the or ganization of a meteorological service whose sole concern it would be to satisfy demands c apiculture by special press and radio reports. *Subject Headings:* **1. Apiculture 2. Agricultura meteorology 3. Hungary.**—*G.T.*

5.11–199 551.586:631 551.521.16:581.03:01

†Burgos, Juan Jacinto (*Chief, Dept. of Agr. Met., Servicio Meteorologico Nacional, B.A.*). **El termoperiodismo como factor bioclimático en el desarrollo de los vegetales.** ["Thermo periodism" as a bioclimatic factor in the growth of plants.] *Meteoros*, Buenos Aires, 2(3/4) 215–242, July/Dec. **1952.** 6 figs., table, bibliog. p. 238–242. English summary p. 21 **DWB**—The extensive bibliography on diurnal and annual periodism in plant growth an maturity (from REAUMUR in 1735 to date) is reviewed and organized, and a classificatio based on what the author calls thermoperiodism, analogous to photoperiodism, proposed an illustrated with temperature and phenological data from the U.S.A. and Argentina. Most o the discussion is concerned with annual thermoperiodism, but examples of diurnal (Buen Aires) and aperiodic (Capo di Monte, Naples, Italy) thermoperiodism are cited and discussed *Subject Headings:* **1. Thermoperiodism 2. Photoperiodism of plants 3. Agricultural me teorology.**—*M.R.*

5.11–200 551.586:631:551.58

Hustich, Ilmari (*Prof. Econ. Geogr.*), **Agricultural production in Finland and the recen climatic fluctuation.** *Fennia*, Helsinki, No. 75:97–105, **1952.** 4 diagrs. **DWB**—The Finnis specialist on the effect of climatic variations on plants (14 papers since 1940, mainly on th growth of forests) analyzed the remarkable increase in the yield of rye in Finland, which closely correlated with the mean temperature of the agricultural year Sept.–Aug. (period 186 1945) and also with the summer temperature. Similar correlations exist for other cereal *Subject Headings:* **1. Climate and crop yield 2. Climatic variations 3. Rye yield 4. Finlan** —*A.A.*

5.11–201 551.586:6

Molga, Marian, **Badania wpływu warunków meteorologicznych na wegetacje i plonowan róslin rolnczych.** [Investigations of the influence of meteorological conditions on the growt and yield of agricultural plants.] *Gazeta Obserwatora PIHM*, Warsaw, 4(7):1–5, June **195 DLC**—Since determination of the exclusive effect of meteorological conditions on the growt and yield of crops can be made best after elimination of all other factors of the plant's enviro ment, the author suggests the introduction of a new system of such investigation. It is base on BAC's idea of organizing a series of experimental agricultural plots in various points Poland chosen for identical soil, methods of cultivation and sequency of crop rotation. Diffe ence in the manner of plant growth and yields accompanied by careful observations of th meteorological conditions will reveal the influence of the latter. *Subject Headings:* **1. Agr cultural meteorology 2. Meteorological influences 3. Plant growth 4. Crop yield.**—*A.M.*

5.11–202 551.586:6

Molga, Marian, **Pora siewu zbóz jarych w Polsce.** [The sowing season of summer cro in Poland.] *Gazeta Obserwatora PIHM*, Warsaw, 4(6):4–8, June **1951.** 3 figs. **DLC** Results of a study of the most appropriate time for the sowing of summer crops, especial wheat and oats, based on phenological, meteorological and agricultural observations dur a period of 4 years (1947–1951). The method of obtaining data and calculating the mo advantageous time of sowing in various parts of Poland is explained. It is shown that a mospheric conditions affect the plants from the time of sowing to harvest and therefore t right time of sowing depends on the totality of meteorological factors. Three original char showing the most advantageous distribution of the sowing period of summer crops in Pola are included. *Subject Headings:* **1. Plant ecology 2. Phenological charts 3. Poland.** *A.M.P.*

5.11–203 551.586:633.12

Nagayama, Moriyoshi, **On the relation between yield of buckwheat and meteorological conditions at Kyushu.** *Oceanography and Meteorology*, Nagasaki, 5(1/2):43–44, June **1951.** In Japanese. 6 tables, ref. **DWB**—Records for 39 years (1902 to 1940) served as a basis for investigation of the correlation between crops and meteorological elements. Correlation coefficients are tabulated for seven locations on Kyushu. They represent yields of buckwheat on one hand and Sept. and Oct. values of temperature, precipitation and sunshine duration on the other. Decrease in yield owing to hoar frost and to strong winds is also considered. *Subject Headings:* **1. Agricultural meteorology 2. Crop yield 3. Buckwheat yield 4. Kyushu, Japan.**—*G.T.*

SYNOPTIC CLIMATOLOGY

5.11–204 551.589.1:551.509.318

*§Bürger, Kurt (*Bad Kissingen*), **Klimatologische Studie über die Temperaturverhältnisse der Grosswetterlagen Mitteleuropas. (Am Beispiel von Karlsruhe und Bremen.)** [Climatological study of temperature conditions of large scale weather situations in Central Europe as shown by the example of Karlsruhe and Bremen.] *Germany. Deutscher Wetterdienst, Bericht*, No. 6, **1953.** 46 p. 6 figs., numerous tables, 32 refs. **DWB**—The following data, based on punched card computations, are given for Karlsruhe and Bremen: frequency distribution of daily temperature means and extremes for large scale weather situations according to the catalog of Hess and Brezowsky (*see item* 5.2–284, Feb. 1954, *MAB*) with means and standard deviations for winter and summer. The same parameters and the asymmetry of the distributions are given also for each month, all days combined and for continental and maritime situations separately. Furthermore, the frequency of ice, frost, summer and hot days is given for each situation. The persistence is computed using Bartel's criterion. Relative temperatures according to Köppen are computed for characteristic combinations of weather situations. *Subject Headings:* **1. Synoptic climatology 2. Weather types 3. Air temperatures 4. Germany.**—*A.A.*

5.11–205 551.589.1

§*Gazzola, Adriano, **Comportamento dei venti al suolo sugli aeroporti di Linate e Malpensa.** [Behavior of the surface winds over the Linate and Malpensa airports.] *Revista di Meteorologia Aeronautica*, Rome, 13(2/3):3–18, April/Sept. **1953.** 7 figs., 2 tables. In Italian; Italian, French, English and German summaries p. 3. **MH-BH**—A fairly elaborate statistical and graphical study of wind speed and direction frequencies at different seasons and times of day under various types of air flow or synoptic situation over Milan. Incidentally the frequencies of the various synoptic types are tabulated and discussed, and synoptic charts presented to illustrate the various types. Based on 3 years of data (1950–1952). *Subject Headings:* **1. Synoptic climatology 2. Wind frequency data 3. Air mass frequencies 4. Milan, Italy.**—*M.R.*

5.11–206 551.589.5

*Hesse, W., **Wintertypen. Eine synoptisch-klimatologische Studie über die letzten 101 Winter in Nordwestsachsen.** [Winter types. A synoptic-climatological study of the last 101 winters in NW Saxony.] *Zeitschrift für Meteorologie*, 7(12):362–373, Dec. **1953.** 12 figs., 6 tables, 9 refs. **DWB**—The following data, partly in graphical form, are given for Leipzig: each day with a diurnal temperature mean below freezing for the winters 1853 to 1953, as well as the total for each winter, degree days below freezing for each month of the same period and precipitation for each winter month of the period 1883–1953. The author proposed a classification of winter types, depending on the time and duration of frost as well as precipitation. The typical large scale weather situations are summarized for each type. Certain rules, statistically verified, are established for the combination of winter type. *Subject Headings:* **1. Frost data 2. Precipitation data 3. Winter types 4. Large scale weather situations 5. Long period records 6. Leipzig, Germany.**—*A.A.*

5.11–207 551.589.5:551.55

Schmuck, Adam, **Rola wiatru w kliacie Dolnego Śląska.** [The role of wind in the climat of Lower Silesia.] *Czasopismo Geograficzne*, Wroclaw, 21/22(68):449–458, **1952.** 2 figs., 2 tables, 22 refs. **DLC**—The importance of winds as a main factor influencing the formation and development of the climate of Lower Silesia is analyzed and discussed in great detail. A characteristic of air masses usually intruding in the region is presented. It is shown that the air temperature, the degree of humidity, the type or absence of clouds, the character of precipitation or of visibility depend on the kind of transported air masses. Graphs showing the distribution of wind directions (wind roses) in diverse localities of the region and tables giving the maximum and minimum frequencies of occurrence of wind directions are included. *Subject Headings:* **1. Air mass characteristics 2. Wind effects on climate 3. Wind roses 4. Lower Silesia.**—*A.M.P.*

MISCELLANEOUS APPLICATIONS

SOLAR INFLUENCES

5.11–208 551.590.21:551.52

Eigenson, M. S., **O mnogovekovom izmenenii solnechnoĭ aktivnosti i ego geofizicheskikh posledstviiakh.** [Secular changes of solar activity and their geophysical consequences.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 85(3):286–287, May/June **1953.** 5 refs. **DLC**—The existence of solar cycles having periods of the order 80–90 years has been pointed out by A. I. Ol'. B. M. Rubashev and others have demonstrated similar cycles of solar activity. L. S. Berg has shown that mean annual temperature at Berlin increased by 0.3°C during the period 1848–1907 above that during 1756–1847 but the average temperature of fall and winter increased by 1°C. Similar increases in temperature are cited for other localities: London, Leningrad, etc. *Subject Headings:* **1. Solar cycles 2. Solar influences 3. Annual temperature variations.**—*I.L.D.*

5.11–209 551.590.21:523.7

Eigenson, M. S., **O 5–6-letnem tsikle solnechnoĭ aktivnosti i solnechno-obuslovlennykh geofizicheskikh iavleniiakh.** [The 5–6 year cycle of solar activity and geophysical phenomena due to solar influences.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 85(3):287–289, May/June **1953.** 4 refs. **DLC**—The author established the definite existence of a double maximum in the 11-year period consisting of a 5 and 6 year cycle. Various geophysical phenomena in the upper atmosphere dependent upon solar influences were found to exhibit a double maximum during the 11 year solar period: namely, thunderstorms in Central Europe, cold waves in European U.S.S.R., level of Scandinavian lakes, relative activity of tropical and polar air, etc. *Subject Headings:* **1. Solar influences 2. Solar cycles.**—*I.L.D.*

METEORS

5.11–210 551.590.2

McKinley, D. W. R., **Détermination à l'aide de radar des hauteurs et des radiants des météores d'essaim.** [Radar measurement of the heights and radiants of meteor showers.] *Académie des Sciences, Paris, Comptes Rendus*, 238(23):2224–2225, June 9, **1954.** 3 refs. **DWB**—In connection with various studies in which it was attempted to locate swarms of meteorites by investigating the distribution of meteor trails, the author discusses the effects of (a) zenithal distance of the radiant and (b) meteor velocity on the height distribution of meteor trails. *Subject Headings:* **1. Meteor trails 2. Meteorites.**—*G.T.*

5.11–211 551.590.25:621.396.

Manning, L. A.; Villard, O. G., Jr. and Peterson, A. M. (*Electronic Res. Lab. of Dept. of Elec. Engr., Stanford Univ.*), **Double-Doppler study of meteoric echoes.** *Journal of Geophysical Research*, 57(3):387–403, Sept. **1952.** 15 figs., 8 refs., 7 eqs. **DWB**—The study of meteoric echoes is greatly facilitated by the use of a twin-channel Doppler presentation, by means of which both the amplitude and phase of the returned signal may be determined

independently. Such a "double-Doppler" system has direct application to the verification of the mechanism of meteor-whistle formation, to the determination of the motion of ionization trails drifting under the influence of upper air winds, and to spectrum analysis of those echoes which exhibit amplitude fading. Examples of the application of the double-Doppler technique to these problems are presented. *Subject Heading:* **1. Meteor echoes.**—*Authors' abstract.*

OPTICAL PHENOMENA

See also: **Geometrical and physical optics** (Morgan), 5.11–6; **Radiation measurements . . .** (Lossnitzer), **5.11–107**; **Atmosph. light . . .** (Wenzel), 5.11–212.

5.11–212 551.593:551.591

*Wenzel, A. (*Lüneburg*), **Das Luftlicht und sein Einfluss auf die Farben in der Landschaft.** [Atmospheric light and its influence on the color of the landscape.] *Optik*, Stuttgart, 10(7): 330–338, **1953.** 6 tables, 3 figs., 9 refs. **DLC**—A highly technical report on experiments to determine the spectral transmission (or color intensity) of the light over woods and fields in various directions in the vicinity of haze sources (industrial towns, etc.) to determine the effect on visibility of objects in the landscape. Extensive tables and graphs illustrate the method and tools for further work along these lines. The conditions encountered in the quantitative determinations were haze layer to 2000 m and to 6200 m height, with vertical and horizontal brightness tabulated in the ranges of 500–1600, 1600–3000, 3000–5000 and 5000–7700 m, etc. *Subject Headings:* **1. Atmospheric optics 2. Visibility in haze.**—*M.R.*

5.11–213 551.593.1:535.32

*Crain, Cullen, M., **Refractometer measured tropospheric index-of-refraction profiles, Vol. 1.** Texas. Univ. Electrical Engineering Research Laboratory, Contracts AF 18(600)-113 and AF 19(604)-494, Report No. 6-02, Feb. 27, **1953.** 27×40 cm. 7 p. 10+42+31 graphs. **DWB**—Refractometer sounding curves are shown on large sheets of graph paper for airplane soundings made in 1952 to 12,000 ft altitude over SW Ohio, off the West Coast of Washington State and west from San Francisco over the Pacific. The peculiarities of the curves are explained in terms of surface stratus layers in marine air off the West Coast, upper layers of super refractive or subrefractive air or steep gradients caused by air mass discontinuities; either on individual days or as a general seasonal condition. On the whole, conditions were more steady off the west coast (Aug.–Oct.) than in Ohio (Aug. 1952). *Subject Headings:* **1. Refractive index 2. Refractometer data 3. Tropospheric refraction 4. Pacific Coast, U.S.A. 5. Southern Ohio.**—*M.R.*

5.11–214 551.593.12

Van Isacker, J., **La scintillation des étoiles.** [The scintillation of stars.] *Belgium. Institut Royal Météorologique, Publications, Ser. B*, No. 8, **1953.** 110 p. figs., tables, 17 refs., eqs. **DWB**—A statistical theory is developed for determining angular distribution, covariant and spectrum of starlight intensity as functions of the variation of refractive index in the atmospheric layers. This method of computation makes it possible to derive upper tropospheric temperatures from star scintillation measurements. The study includes an analysis of the observations made in Ireland by Butler. It is shown how the theory can be applied to scintillation of radio stars and to fading of radio waves reflected by the ionosphere. *Subject Headings:* **1. Scintillation 2. Atmospheric refraction 3. Upper air temperature measurement.** —*G.T.*

5.11–215 551.593.53:523.77

Karpov, A., **Goluboĭ tsvet neba s tochki zreniia spektrometrii.** [The blue color of the sky from the viewpoint of spectrometry.] *Meteorologicheskiĭ Vestnik*, Leningrad, No. 1/2:17–20, Jan./Feb., **1935.** fig., 5 tables, 2 refs. **DLC**—Method and results of 213 spectrometric measurements of the blue region of the sun's spectrum (from 430 to 830 mλ wave length) at zenith and light reflected from Cu and other clouds, made at Ershov Meteorological Station near Saratov on the Volga from Jan. 1, 1933 to Jan. 25, 1934, are presented and discussed. They show that the variation of the blue color coincides exactly with the radiation variation.

Changes of the sky's coloring and a decrease of the blue part were observed in connection with S. winds bringing smoke from the city or in presence of a snow cover in winter or a green cover in spring. *Subject Headings:* **1. Sky light color 2. Sun's spectrum.**—*A.M.P.*

ELECTRICAL PHENOMENA

See also: **World symposium on spherics** (Israël), 5.11–3; **Spectra and chemical kinetics of the upper atmosphere** (Resnick, Stein), 5.11–7.

5.11–216 551.594

Israël, Hans (*Aachen, Germany*), **Luftelektrische Synopsis.** [Synoptic methods in atmospheric electricity research.] *Germany. Deutscher Wetterdienst, Mitteilungen*, No. 7, April **1954.** 10 p. 3 figs., 19 refs. **DWB**—In this review of recent progress in atmospheric electricity research, the author conveys the idea that the initial stage of statistical investigation is now (after problems of measurement techniques and methodology have been overcome) being followed by the more advanced stage of "synoptic" investigation of individual situations. The International Geophysical Year 1957–1958 will provide a welcome opportunity for applying the new working methods on a larger scale. *Subject Headings:* **1. Atmospheric electricity 2. Progress in meteorology.**—*G.T.*

5.11–217 551.594.11

Israël, H., **Ergebnisse der luftelektrischen Arbeiten in Buchau a.F. Studien über das atmosphärische Potentialgefälle VII.** [Results of atmospheric electricity investigation in Buchau. Studies of atmospheric potential gradient VII.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:266–282, **1954.** 6 figs., 5 tables, 5 refs. German, English and French summaries p. 266–267. **MH-BH**—Measurements of potential gradient and air-earth current and calculated conductivity at Buchau-Kappel, Württemberg, far from cities, are tabulated and described. In winter potential gradient and air-earth current run almost parallel, indicating small variation of conductivity. In summer the curves of potential gradient and air-earth current are opposite, especially on days free from disturbance. The instrumental setup is described; it gave similar variations to those obtained earlier with a Benndorf electrometer. *Subject Headings:* **1. Potential gradient measurements 2. Electrical conductivity of air.**—*C.E.P.B.*

5.11–218 551.594.22

Israël, Hans, **Elektrische Entladungsformen beim Gewitter.** [Electric discharge forms during thunderstorms.] *Germany. Deutscher Meteorologischer Dienst im Französischen Besatzungsgebiet, Wissenschaftliche Arbeiten*, 1:58–62, **1947.** 2 figs., 7 refs. In German; German and French summaries p. 62. **DLC**—Three different forms of lightning discharge are described and illustrated. The upper part of the cloud is considered to be positively charged and the lower part negatively charged. Discharges occur from cloud to ground, cloud to cloud, within the cloud and from the cloud upwards. *Subject Heading:* **1. Lightning forms.**—*M.R.*

5.11–219 551.594.221:535.33

*Israël, Hans and Wurm, K., **Das Spektrum der Blitze.** [Lightning spectrum.] *Germany. Deutscher Meteorologischer Dienst im Französischen Besatzungsgebiet, Wissenschaftliche Arbeiten*, 1:48–57, **1947.** fig., 3 tables, 11 refs. **DLC**—The lightning spectrum consists of numerous lines or bands of neutral molecular, or ionized atomic, oxygen or nitrogen against a continuous background. The relative intensity of the lines varies along the path of the discharge. In some cases polarized lines of Ca appear within 2 m of the place where the lightning strikes the ground. The author presents, in an extensive table, the detailed results of 56 groups, lines or bands from 3582 Å to 6560 Å, obtained during a flash on July 19, 1941, and 118 more identifications obtained from 6 other spectra. These are comparable to scores of identifications made by other authors, which are also listed in order of wave length from 3007 to 6560 Å for lines and 2975 Å to 4653 Å for bands (N_2). *Subject Heading:* **1. Lightning spectrum.**—*M.R.*

5.11–220 551.594.5:550.38

Israël, Hans, **Extraterrestrische Einflüsse auf das luftelektrische Feld.** [Extraterrestrial influence on the atmospheric field.] *Germany. Deutscher Meteorologischer Dienst im Französischen Besatzungsgebiet, Wissenschaftliche Arbeiten*, 1:62–67, **1947.** 2 figs., table, 17 refs. In German; German and French summaries p. 67. **DLC**—The four extraterrestrial causes of the atmospheric electric charges which vary from day to day are: 1) cosmic rays, 2) corpuscular radiation from the sun, 3) UV discharges from the sun and 4) sunspot and related activity. Numerous attempts have been made since 1872 to show a quantitative relation between aurora and electric charge in the atmosphere. A chart (after J. Scholz, 1935) shows a rise in the electric field, increase in current and conductivity about 15–20 min before an aurora and a sharp drop at onset to a minimum about 10 min after the onset of the aurora. Other authors' theoretical explanations of positive charge without aurora and negative or < positive during aurora are presented. *Subject Headings:* **1. Atmospheric electricity 2. Auroral effects on geoelectric field.**—*M.R.*

5.11–221 551.594.7:551.510.535

Ryle, M. and Hewish, A., **The effects of the terrestrial ionosphere on the radio waves from discrete sources in the galaxy.** *Royal Astronomical Society, Monthly Notices*, 110(4):381–394, **1950.** 3 figs., 14 refs. Summary in its *Geophysical Supplement*, 6(2):138, Oct. **1950. DWB**—Observations of the discrete sources of radio waves in the galaxy have shown the existence of irregular refraction processes in the terrestrial ionosphere. These irregularities cause rapid fluctuations in the intensity of the radiation at the ground, while observations with aerials of high resolving power have shown, in addition, that the apparent position of a source may vary irregularly by 2–3 minutes of arc. The incidence of these irregularities shows a marked diurnal variation having a maximum at about 01h 00m local time. It does not seem possible to account for the irregularities in the ionosphere in terms of solar emissions and an alternative mechanism is proposed, based on interception of interstellar matter moving under the gravitational attraction of the sun. Further experiments may provide information of interest in theories of the accretion of matter by the sun. *Subject Headings:* **1. Galactic radio noise 2. Ionospheric radio wave refraction.**—*Authors' abstract.*

5.11–222 551.594.7:550.385

Tsukada, Sohei (*Central Radio Wave Observatory*), **Field intensity of WWV during geomagnetic disturbances.** *Japan. Science Council, Ionospheric Research Committee, Report of Ionosphere in Japan*, 5(4):197–198, **1951. DWB**—Abstract of a scientific study of two fluctuations in the field intensity of the station WWV (Bureau of Standards, Wash., D. C.) received at Hiraiso, Japan from July, 1949 to Dec. 1950. Three types of fluctuations and their diurnal and annual course are briefly discussed. *Subject Headings:* **1. Radio wave propagation 2. Geomagnetic disturbances.**—*A.A.*

5.11–223 551.594.7:621.396

Vilenskiĭ, I. M. **K teorii vzaimodeĭstviia radiovoln v ionosfere.** [The theory of radio wave interaction in the ionosphere.] *ZHurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, Moscow, 22(5):544–561, May **1952.** 2 tables, 9 refs., 78 eqs. **DLC**—A highly theoretical paper on the interaction of radio waves containing a calculation of all high frequency terms of such interferences. The theoretical analysis shows that in case of radio wave interaction in the atmosphere there takes place not only the phenomenon of cross modulation (the Luxemburg-Gorkiĭ effect) but also the formation of "side (lateral)" waves, waves with combination frequencies. In the course of the analysis the author derives and discusses terms for amplitudes of "lateral" waves. The role of collision of electrons with ions in various cases has also been investigated. *Subject Headings:* **1. Radio wave propagation 2. Ionosphere.**—*A.M.P.*

PART II. SELECTIVE ANNOTATED BIBLIOGRAPHY ON WIND WAVES AND SWELL

By: *Mollie P. Kramer*

INTRODUCTORY NOTE

This bibliography is the third in a series on marine meteorology and climatology. For references to the "Marine meteorology and climatology of the Pacific" and "General oceanographic meteorology" see the Sept. 1953 and Jan. 1954 issues, respectively. Bibliographies on "Energy exchange," "Storm surges," "Ocean currents," and additional regional studies are in preparation.

Waves of the sea can result from, 1) submarine volcanic or seismic activity, 2) pulse of the tidal producing forces, 3) objects falling into or propelled through the water, 4) barometric pressure changes and 5) wind blowing over the surface. Here we are concerned primarily with the fifth category.

The references below represent but a small sample of the vast literature on wind and waves selected to include items on all the main subdivisions of the field including ocean wave measurement forecasting and physical characteristics. Particular emphasis was laid on selecting works on the theoretical relationships between wind and waves as evidenced in wave generation, development propagation, and decay.

For the most recent literature not included below consult the Program of the International Union of Geodesy and Geophysics, General Assembly at Rome in September 1954.

The library symbols DN-HO and MWB identify those items easily obtainable at the U. S. Hydrographic Office, Suitland, Md., and the Marine Biological Laboratory, Woods Hole, Mass. respectively. Material can be obtained from the latter on interlibrary loan between Oct. 15 and May 15.

We wish to express our appreciation to Mr. Wilbur Marks of the Woods Hole Oceanographic Institution for his interest and advice.

SUBJECT OUTLINE

GENERAL REFERENCE WORKS

California. University, Scripps Institution of Oceanography, **Wave Reports**

Coastal Engineering Conferences, 1st–4th, **Proceedings,** 1950–1953

Defant, A., Kuhlbrodt, E. and Roll, H-U., **Wind, Wetter und Wellen auf dem Weltmeere.** [Wind, weather and waves on the oceans.] Berlin, 1940 (5A–29)

Haurwitz, B. (ed.), New York Academy of Science, Anna's, **Ocean Surface Waves,** 51(3), 1949

Krümmel, J. G. O., **Handbuch der Ozeanographie,** 2 vols., Stuttgart, 1907, 1911 (5A–9)

Lamb, H., **Hydrodynamics,** 6th ed., New York, 1945 (4A–71)

Proudman, I., **Dynamic oceanography.** London 1953 (5A–58)

SHuleikin, V. V., **Ocherki po fizike moria.** [Outline of the physics of the sea.] Moscow, 1949 (5A–45), and **Fizika Moriia** (3rd ed.), Moscow, 1953

Sverdrup, H. U., Johnson, M. W. and Fleming, R. H., **The oceans,** New York, 1942 (5A–32)

U. S. Beach Erosion Board, **Technical Memorandum**

U. S. National Bureau of Standards, Circular No. 521, **Symposium on gravity waves,** 195

Zubov, N. N., **Dinamicheskaia okeanologiia** [Dynamic oceanography.] Moscow 194 (5A–41)

General reference works included in this bibliography, 5K–1, –3, –40, –146

Textbooks, 5K–8, –10, –21, –32, –66, –9 –156, –186, –193

Manuals, 5K–17, –104, –129, –137, –174, –18 –191

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BIBLIOGRAPHY ON WIND WAVES AND SWELL

1809

5K–1 532.59

Gerstner, Franz, **Theorie der Wellen.** [Theory of waves.] *Annalen der Physik*, Leipzig 32:412–445, **1809.** eqs. **MWB**—First known mathematical solution for finite height, periodi waves of stable form. GERSTNER arrived at conclusion that the surface curve was trochoidal i form. *Subject Heading:* **1. Ocean wave theory.**—*R. L. Wiegel and J. W. Johnson.*

1847

5K–2 532.59

Stokes, G. G., **On the theory of oscillatory waves.** *Cambridge Philosophical Society, Trans actions* 8(4):441–455, **1847.** 48 eqs. **DLC**—Stokes presents an approximate solution for waves o finite height satisfying the boundary conditions of waves in water of uniform depth and requirin irrotational motion. Interesting features of the solution (found correct by later experiments) ar 1) the dependency of the wave velocity on wave height as well as on wave length and water dept and 2) the fact that orbital motion of the particles is open rather than closed, indicating a ma transport in the direction of wave travel. *Subject Headings:* **1. Ocean wave theory 2. Irrotationa wave theory.**—*R. L. Wiegel and J. W. Johnson.*

1876

5K–3 532.59

Rayleigh, Lord, **On waves.** *Philosophical Magazine, 5th Ser.*, 1(4):257–279, April **1876.** 2 figs 24 eqs. **DLC**—Starting from the classic experiments of LAGRANGE dealing with the theory of wave in a uniform canal of rectangular section in which wave velocity is relative to the undisturbed wate author develops theory for case in which a velocity, equal and opposite to that of the wav is attributed to the water in the canal and the problem becomes one of steady motion because th wave form is fixed in space. *Subject Headings:* **1. Solitary wave theory 2. Hydrodynamics.**

1877

5K–4 532.59

Rayleigh, Lord (John William Strutt) **On progressive waves.** *London Mathematical Societ Proceedings*, 9(8):21–26, Nov. **1877.**—OSBORN REYNOLDS (*Nature*, 16:343–344, Aug. **1877**) and LOR RAYLEIGH worked on problem of the difference between the energy transmission velocity of a wav group and the velocity of the wave form. They concluded that the energy of the group of wav was propagated with a velocity less than that of the individual waves. In deep water, the "grou velocity was found to be ½ of the wave velocity. *Subject Headings:* **1. Ocean wave theory 2. Ocea wave propagation.**—*R. L. Weigel and J. W. Johnson.*

1893

5K–5 551.465:532.5

Mitchell, J. H., **On the highest waves in water.** *Philosophical Magazine*, 36(5):430–437, 189 fig., table, eqs. **DLC**—Early study of the maximum steepness (wave height/wave length) that wave can attain without breaking. Crest angle of 120 degrees, or H/L = 0.142, found to be t theoretical limit. For early theoretical study see: Helmholtz, Hermann L. F. von, **Über disco tinuirliche Flüssigkeitsbewegungen.** [On discontinuous motions in liquids.] (In his: *Wisse schaftliche Abhandlungen*, Berlin, 1:146–156, **1882.** Translation in: *Smithsonian Miscellaneo Collections*, 34(843):58–66, **1893.**) *Subject Headings:* **1. Ocean wave theory 2. Ocean wave heigh**

1923

5K–6 551.556:532.593:551.4

Shuleĭkin, Vasiliĭ V., **Novyĭ metod issledovaniia profilia voln.** [A new method of investigati wave profiles.] *Moscow, Morskoĭ Nauchnyĭ Institut, Trudy*, No. 5:8–10, **1923.** fig., refs., 2 e

n Russian, German summary, p. 10. **DLC**—An optical method of studying wave profiles by ɔticing the variety in the reflection of the sun's or moon's rays from the sea surface is described. bservations may be made by means of photographic plates or directly through the use of a sextant. *ubject Heading:* **1. Ocean wave measurement.**

1926

5K–7 551.556:532.593

*Cornish, Vaughan, **The relation between velocity of wind and wave.** *Nature*, London, 18(2975):665–666, Nov. **1926.** table, refs. **DLC**—Author reviews several specific cases of unusual ave activity in this review of some points of interest of the wind-wave investigation the results of hich may be found in **"Observations of wind, wave and swell on the North Atlantic Ocean,"** *Royal leteorological Society, Quarterly Journal*, April **1926.** Hindering of wave action by swell discussed. *ubject Headings:* **1. Wind-wave energy transfer 2. Ocean wave travel velocity.**

1932

5K–8 532.5(02)

Lamb, Horace, **Hydrodynamics.** Cambridge University Press, Cambridge, **1932.** 6th ed. 38 p. figs., tables, refs., eqs. **DLC**—For extensive discussion of surface waves, see chap. IX ɔ. 363–475) and of viscosity (including sheltering theory and dissipation of energy) see chap. XI ɔ. 562–696). *Subject Headings:* **1. Ocean wave theory 2. Eddy viscosity 3. Hydrodynamics.**

5K–9 551.556:532.593

†Patton, R. S. and Marmer, H. A., **The waves of the sea.** *Physics of the Earth*, N. Y. Vol. V, ceanography, p. 207–228, **1902.** Also issued as *National Research Council, Washington, D. C., ulletin* No. 85. 3 figs., 38 refs., eqs. **DLC**—A brief review of the theory of wave movement is llowed by a discussion of wave measurement, the relation of waves to wind, swell, the calming of aves, shallow water waves, the wave of translation, wave energy, seismic waves and seiches. *Subct Heading:* **1. Ocean wave theory.**

1934

5K–10 551.465:550.3

Cornish, Vaughan, **Ocean waves and kindred geophysical phenomena.** Cambridge, University ress, **1934.** 164 p. 26 plates, 2 diagrs., bibliog., p. xv. (See also: *Ibid.*, **Waves of the sea and ther water waves.** Chicago, Open Court Publishing Co., **1910.** 374 p. **DLC.**) **DPL**—Good verage of the size and speed of ocean waves in relation to the velocity of wind. Waves in sand nd snow and tidal bores and other progressive waves in rivers are also discussed. Well illustrated ith photographs. *Subject Headings:* **1. Ocean waves 2. Tidal bores 3. Swell.**

5K–11 551.465

Whitemarsh, R. P., **Great sea waves.** *U. S. Naval Institute, Proceedings*, 60:1094–1103, Aug. **934.** fig., table, photo. **DN-HO**—Popular discussion of highest possible wave height and length. ighest wave reported, 112 feet; longest, 2,600 ft. with a period of 23 seconds. *Subject Heading:* **Ocean wave height.**

1936

5K–12 551.465:551.515.2

Tannehill, Ivan Ray, **Sea swells in relation to the movement and intensity of tropical storms.** *Monthly Weather Review*, 64(7):231–238, 1936. 9 figs., 3 tables, 8 refs. **DLC**—Diagrams illustrate he swell patterns associated with tropical storms and the deviation of such swell or waves from wind rection and path of the storm center. Shore observations of swell period indicate intensity of the pproaching storm. Swell direction observed on shore is meaningless as an indicator of the direction the storm center. A plea is made for more extensive observation and further analysis of data. *ubject Headings:* **1. Forerunners of swell 2. Tropical storms 3. Gulf of Mexico.**

5K–13 551.465:681:77

Weinblum, Georg and Block, Walter, **Stereophotogrammetrische Wellenaufnahmen.** [Stereoɔtogrammetric wave photography.] *Schiffbautechnische Gesellschaft, Jahrbuch*, 37:214–250, 259–6, **1936.** Original unchecked. Translation by F. A. Raven in *U. S. Navy Dept. David W. Talyor odel Basin, Translation*, 204, Nov. **1949.** 76 p. 46 figs., tables, 12 refs., 14 eqs. **DN-HO**—ereophotogrammetric plots, wave profiles, and tabulated wind conditions which correspond to set photographs taken on board the German research vessel "San Francisco" are presented. Stereoɔtogrammetric method of plotting explained. *Subject Headings:* **1. Ocean wave measurement Stereophotogrammetry. I. Raven, F. A.** (*trans.*).

1943

5K–14 551.465:551.509

*Treloar, H. M., **Report on test of British method of forecasting sea and swell with Tasman Se situations.** *Australia. Meteorological Service (R.A.A.F.), Research Reports*, Ser. 10, No. 9, Oc **1943.** 14 p. tables, charts. **DWB**—Comparison of observed with calculated ocean wave height off the New South Wales coast (with wave heights varying from 6 to 30 ft and fetch from 140 t 1,000 miles) showed significant agreement in all but one case. Two cases in which seas of 15 an 30 ft, respectively, developed in 6 hours were among those examined. Charts and tables givin originating winds and resultant swells extracted from a British Naval Meteorological Branch Mem orandum are appended. *Subject Headings:* **1. Ocean wave forecasting 2. Ocean wave height da 3. Tasman Sea.**

5K–15 551.556:551.465:551.509.

U. S. Air Force. Technical Training Command, Chanute Field, Illinois, **Outline for the cour in forecasting of wind waves and swells.** Dept. of Weather, Division of Aviation Meteorologic Cadets, Nov. 15, **1943.** 36 p. figs., 5 plates, eqs. **DWB**—Starting from Stokes' equations motion in water waves, discussion proceeds to a brief summary of shallow and deep water wa theory, energy of a wave, advance of energy flow, wave front in deep water, resultant interferen pattern, irrotational waves of finite height, energy transfer from wind to waves, energy receiv by stress, wind-wave energy relationships during propagation and decay, growth of waves in tim wave modification near shore, and swell forecasting. *Subject Headings:* **1. Ocean wave theo 2. Ocean wave forecasting 3. Manuals.**

5K–16 551.556:532.5

*Yasui, Z. and Segi, T., **Studies on the relations between the winds on the land and on the se and waves in the centre of the Ōsaka Bay.** *Sea and Sky (Umi to Sora)*, Tokyo (pub. by Jishu-Ka 23(3):1–12, **1943.** 5 figs., table. In Japanese, English summary attached. **DLC**—From Ko Marine Observatory data, May 1942 to May 1943, the ratios of wind velocity in the center of Ōsa Bay to wind at Kobe, the relationships between wind velocity and wave characteristics and the cen of the Bay, and the distribution of wave elements from Kobe harbor to the center of the Bay a computed. See also: Yasui, Z. and Saito, Y., **A study of the wave.** *Ibid.*, 21(7):197–201, 19 **DLC.** *Subject Headings:* **1. Wind waves 2. Ōsaka Bay, Japan.**

1944

5K–17 551.465(

Bigelow, Henry B. and Stetson, Henry C., **A manual of ocean waves, of surf and of beach** *Woods Hole Oceanographic Institution*, June **1944.** Ms. 66 p. 47 figs., refs. **WH-MBL**— simple but comprehensive coverage of waves in general, cause and character of surf, and beaches. special interest to meteorologists are the discussions of wind and wave formation (p. 3–4), wa height (p. 4–10), wave length (p. 10–13), wave velocity (p. 18), wave and swell direction of progr (p. 13, 23–24), hurricane waves (p. 25) and formation of breakers (p. 33–36). The author poi out that "no fully satisfactory account of how the wind produces waves has yet been given, thou the process by which waves, once set in motion are increased in size by the wind, is fairly well und stood." *Subject Headings:* **1. Ocean waves 2. Surf 3. Manuals.**

5K–18 534:551.

*Knudsen, Vern Oliver; Alford, R. S. and Emling, J. W., **Survey of underwater sound.** *U Office of Scientific Research and Development, [Report]* No. 4333, Sept. 26, **1944;** PB 31-21. 24 figs., tables, refs. **MWB**—This report comprises a summary of much of the work done in measur ambient noise, containing most of the existent data on the subject. The magnitude of "water noi (as distinguished from fish and ship noise) is probably related in a complex manner to variables s as wave height, wave steepness and number of whitecaps. A graph on p. 106 indicates the relat between overall noise level and wave height. Measurements of ambient noise may therefore prov a useful approximate method for describing the height of the waves. *Subject Headings:* **1. Oc wave height 2. Ambient noise.**

5K–19 551.465:551.50

*U. S. Hydrographic Office, **Breakers and surf; principles in forecasting.** Its *Pub.* No. **1944.** vii, 52 pp. 19 figs., tables, 4 plates, eqs. Also: **Supplement,** Nov. **1950.** 16 p. fl tables. **DN-HO**—Report deals with the various factors which bring about the transformatio swell (from time when it enters shallow water until it breaks on beach) and which must be ta into account when the forecast is to be extended from deep water into the surface zone. P comprises a discussion of theoretical and empirical knowledge of waves in shallow water. Pt

ntains a description of forecasting procedure and Pt. III is devoted to the verification of forecasts om aerial photographs. *Subject Headings:* **1. Breakers 2. Surf 3. Shallow water wave theory Ocean wave forecasting.**

1945

5K–20 532.593

†Rossby, C.-G., **On the propagation of frequencies and energy in certain types of oceanic and mospheric waves.** *Journal of Meteorology*, 2(4):187–204, Dec. **1945.** 2 figs., 21 refs., 171 eqs. **WB**—Rossby studies the energy propagation in a particularly simple type of long atmospheric aves and tests his theory through an analysis of the frequency and energy propagation in long ravitational plane waves on a rotating sheet of water. He attempts to arrive at a simpler derivation group velocity and of its significance and introduces basic considerations on the period increase of conservative waves." *Subject Headings:* **1. Ocean wave propagation 2. Ocean wave theory Atmospheric waves.**

5K–21 551.465(02)

†Stewart, John Quincy (*Princeton Univ.*), **Coasts, waves and weather for navigators.** Boston, inn, **1945.** 348 p. figs., photos, bibliog. p. 340–342. **DLC**—A broad, well illustrated, non-chnical treatment of 1) coast lines, terrain and routes; 2) oceanography for navigators; and 3) me-orology for navigators. Extensive bibliography and good index included. *Subject Headings:* **Textbooks 2. Ocean waves 3. Marine meteorology.**

5K–22 551.556:551.465:551.509.39

Suthons, C. T., **The forecasting of sea and swell waves.** *Great Britain. Naval Meteorological anch, Memorandum*, 135/45, **1945.** 84 p. 62 figs., diagrs., photos, seqs. **DN-HO**—Wave forecast anual containing theoretical discussion of the generation of sea waves by wind, the travel and decay waves as swell and the changes in waves near the shore. Suthons ascribes lengthening of waves sea and swell and part of the decay of swell to the effect of eddy viscosity which tends to increase e depth of water affected by the wave motion by transporting kinetic energy downwards. Forecast agrams included. Appendix gives simple methods by which measurements of wave dimensions n be obtained. *Subject Headings:* **1. Ocean wave forecasting 2. Wind-wave energy transfer Ocean wave propagation 4. Shallow water wave theory 5. Ocean wave measurement.**

1946

5K–23 551.465:519.24

Barber, N. F.; Ursell, F.; Darbyshire, J. and Tucker, M. J., **A frequency analyser used in the udy of ocean waves.** *Nature*, London, 158(4010):329–332, Sept. **1946.** 6 figs., eqs. **DLC**—escription and explanation of the wave analyzer developed at the Admiralty Research Laboratory, eddington, 1944, in operation since 1945 near Lands End. *Subject Headings:* **1. Underwater wave corders 2. Ocean wave measurement 3. Lands End, England.**

5K–24 551.556:532.59:551.588

Champion, Donald L., **Wind and sea at coastal stations and the effects of the angle between ind and shore.** *Royal Meteorological Society, Quarterly Journal*, 72(312/313):221–229, **1946.** figs., table. **DLC**—After an attempt to determine the variations of sea disturbance relative to the gle between wind and shore (using 17,000 observations), the author concludes that "no general w can be formulated which would be applicable to every coastal station." Fetch, swell, currents, dal streams and local topography are more dominant influences on wave conditions. *Subject eadings:* **1. Ocean wave height 2. Wind-wave energy transfer.**

5K–25 551.465:519.24

Darbyshire, J., **Statistical survey of wave characteristics at Perranporth for the year September 945–August 1946.** *Teddington, England. (Admiralty) Research Laboratory, ARL*/N4/103. W, ct. 4, **1946.** 2 p. 5 figs. **DN-HO**—Graphic presentation of wave periods and heights from 25 inute records (every 4 hrs) at Perranporth, Cornwall. *Subject Headings:* **1. Ocean wave periods Ocean wave height 3. Cornwall, England. I. Great Britain. Admiralty Research Laboratory.**

5K–26 551.556:532.593:551.465

Fediaevskiĭ, K. K., **O vozniknovenii vetrovykh voln.** [On the origin of wind waves.] *Akamiia Nauk SSSR, Isvestiia*, 10(3):285–291, **1946.** 4 figs., 5 refs., 18 eqs. **DLC**—Author shows at the distribution of pressure in the wave and the law of the wave's pressure-resistance, supposed Jeffreys' theory are not true. Proceeding from the hypothesis that the development of gravity aves proceeds under the influence of the resistance suffered by the capillary waves, and supposing new law of the wave's pressure-resistance, the author derives an expression for the critical wind

velocity, at which the development of gravitation waves begins. This critical wind-velocity appea to be proportional to the square root of the ninth degree of the capillary wave's amplitude. *Subj Headings:* **1. Ocean wave generation 2. Critical wind velocity.**—*From author's abstract.*

5K–27 551.465:0

†Lee, Claude C., **Waves and wave action.** A bibliography of books, periodicals and socie publications appearing from 1687 through March 1946. [Rev. ed. **1946.**] Loose leaf. 91 plus supplementary leaves with decimal notation for ease of inclusion. **DWB**—976 refs. includi the 110 refs. on Seiches in the Supplement No. 1 (appended). Arranged alphabetically by autho supplementary chronological and subject indexes. Foreign titles translated. Some articles a stracted. A bibliography prepared for the engineering profession as a whole. *Subject Headin* **1. Ocean wave bibliographies 2. Seiches.**

5K–28 551.465:551.5

*§Netherlands. Meteorologisch Instituut, **Results of the international observations of swell the North Atlantic ocean, November 14–19, 1938.** *Netherlands. Meteorologisch Instituut, No.* 12 **1946.** 28 p. 11 tables, charts, plates, appends. **MWB**—Pt. I comprises the tabulated results a statistical analysis of available swell observations from 210 ships cooperating in an internatio swell observation week, Nov. 14–19, 1938 in the North Atlantic Ocean. Tables show relatio between length and height; swell period, length, velocity, and wind force; and wind force and sc for sea disturbance. Pt. II contains a synoptic representation of the observations and inclu synoptic charts of swell, a weather analysis, discussion of swell characteristics, a comparison of t dimensions of swell reported by adjacent ships in different localities and a comparison of the observ lengths of period of 15 seconds and more. Remarks by C. E. N. FRANKCOM, E. W. BARLOW a C. T. SUTHONS appended. *Subject Headings:* **1. Ocean swell data 2. North Atlantic Ocean 3. I ternational Meteorological Organization.**

5K–29 551.556:532.5

Sverdrup, Harald Ulrik and Munk, Walter H., **Empirical and theoretical relations betwe wind, sea, and swell.** *American Geophysical Union, Transactions,* 27(6):823–827, Dec. 19 4 figs., ref., 2 eqs. **DWB**—In spite of the poor quality of the empirical data available, ratio relationships between wind and sea can be established by considering the effects of energy trans from wind to waves in the form of normal pressures and tangential stress. The concept of "signific waves" is introduced to simplify the statistical treatment of wave data. Relationships are illustrat by diagrams on which are plotted (1) wave steepness against wave age and (2) wave height and sp against wind fetch and velocity. A plea is made for further systematic observations. *Sub Headings:* **1. Ocean waves 2. Wind-wave energy transfer.**

5K–30 551.556:532.593:551.509

Sverdrup, Harald Ulrik and Munk, Walter H., **Theoretical and empirical relations in forecast breakers and surf.** *American Geophysical Union, Transactions,* 27(00):828–836, **1946.** 8 fi 4 refs., 4 eqs. **DWB**—The relations are given which govern the transformation of waves in shall water and upon which practical methods for forecasting breakers and surf have been based. each relation the theoretical background is states, together with a brief summary of empirical dence. The discussion includes examples of the application of some of the relations. *Sub Headings:* **1. Shallow water wave theory 2. Breakers 3. Ocean wave forecasting.**—*Auth abstract.*

1947

5K–31 551.556:532.593:551.509

Bates, Charles C., **A procedure for rapidly forecasting ocean swell.** *American Meteorolog Society, Bulletin,* 28(5):228–232, May **1947.** 3 figs., table, 3 refs. **DWB**—A procedure, based the work of SVERDRUP and MUNK (see 5K–29 and 5K–30 above), is described by which swell ch acteristics may be forecast rapidly. Specific wave generating areas defined by the fixed paramet wind duration and fetch, and the variable parameter, wind velocity, are established. The chang swell characteristics as the swell moves away from these generating areas is illustrated by gra which may be re-drafted as transparent overlays at the scale of the synoptic weather chart f which swell forecasts are to be made. *Subject Heading:* **1. Ocean swell forecasting.**—*Auth abstract.*

5K–32 551.556:532.593

*Bigelow, Henry B. and Edmondson, W. T., **Wind waves at sea. Breakers and surf.** *U Hydrographic Office, Publication,* No. 602, **1947.** 177 p. 57 figs., 24 plates, 37 tables, bibliog. p. **DPL**—The first popular book on the subject in more than a decade. A simple, comprehen

ccount of wind waves, it incorporates much of the published findings of recent date and includes art of the unpublished wartime U. S. Navy contract work at Woods Hole, Scripps and the University f California at Berkeley. Among the chief topics discussed are the physical nature of wind waves, ieir dimensions and contours: sea and swell and their heights and frequencies; breakers and surf nd their relation to bottom contours, shore configuration and meteorological conditions. Well lustrated with numerous tables and excellent photographs. *Subject Headings:* **1. Ocean waves . Breakers 3. Surf 4. Manuals.**

5K–33 551.465:550.34

Deacon, G. E. R., **Relations between sea waves and microseisms.** *Nature*, London, 160(4065): 19–442, **1947.** fig., 10 refs. **DWB**—A review of the status of research and investigation on the elationship between microseisms and sea waves. Various explanatory theories including waves n a coastal area, waves in the open sea and atmospheric oscillations are briefly summarized. Im- ortance of the discovery of the approximately 1/2 ratio between the period of the microseisms and he wave periods stressed. *Subject Heading:* **1. Microseisms from ocean waves.**

5K–34 551.465:532.593

Johnson, J. W., **The refraction of surface waves by currents.** *American Geophysical Union, Transactions*, 28(6):867–874, Dec. **1947.** 7 figs., ref., 8 eqs. **MH-BH**—When ocean waves, moving hrough deep still water, encounter a current, moving at an angle with the wave direction, the waves ndergo a change in length, steepness, and direction of travel. A theoretical development is given or these factors in terms of initial wave length and direction, and the magnitude of the current. Discussion is included of the action of a coastal current in affording protection against short period vaves. For discussion of the above article and for observational material, see J. D. Issacs, *Ibid.*, 9:739–741, **1948.** *Subject Headings:* **1. Ocean wave refraction 2. Ocean currents.**—*Author's bstract.*

5K–35 551.556:532.593

Munk, Walter Heinrich, **Increase in the period of waves traveling over large distances: with pplication to tsunamis, swell, and seismic surface waves.** *American Geophysical Union, Trans- ctions*, 28(2):198–217, **1947.** 10 figs., 3 tables, refs., 76 eqs. **DWB**—Author derives expression

$$\frac{\partial T}{\partial x} = \left(\frac{1}{C} - \frac{1}{V}\right)\frac{\partial T}{\partial t}$$

in which T is increase in period of wave whose identity was conserved over listance x; V is group velocity; C, wave velocity, and $\partial T/\partial t$, the rate of period decrease at a fixed oint. The equation was applied to the tsunami of April 1, 1946, to long forerunners of swell ecorded at Pendeen, England, and to the Mexican earthquake of Feb. 22, 1943 and Montana earth- uake of June 28, 1943. Application of the theory to the period increase of swell seems to provide a imple, rational basis for locating and tracking storms at sea by means of swell observations and nay therefore be of interest in weather forecasting. For later article by same author, *see* **Note n period increase of waves,** *Seismological Society of America, Bulletin*, 39(1):41–45, Jan. **1949.** *Subject Heading:* **1. Ocean wave theory.**—*From author's abstract.*

5K–36 551.465:551.515

Munk, Walter H., **Tracking storms by forerunners of swell.** *Journal of Meteorology*, 4(2):45–57, April **1947.** 13 figs., 8 refs., 20 eqs. **DWB**—Long, low waves preceding the arrival of visible swell rom a storm have been recorded off Pendeen, England, and Woods Hole, Mass., by means of new nstruments for the measurement and analysis of ocean waves. These forerunners provide storm varnings of practical value. Expressions giving the forerunner's distance from the storm and its ravel time as functions of recorded period and rate of change of period are derived. The application f the method to tracking storms across the ocean is illustrated by actual examples. Computed torm tracks agree well with information on weather maps. Certain features of wave records may ventually compute size, intensity and general character of the storm as well as location. *Subject Headings:* **1. Forerunners of swell 2. Ocean storm tracking 3. Underwater wave recorders 4. Pen- leen, England 5. Woods Hole, Massachusetts.**—*Author's abstract.*

5K–37 532.593:551.465

O'Brien, M. P. and Johnson, J. W., **Wartime research on waves and surf.** *Military Engineer*, 9(260):239–242, June **1947.** 3 figs., ref. **DN-HO**—Results of investigations by the University f California, Berkeley, and the Scripps Institution of Oceanography at La Jolla, Calif., into waves, urf and related phenomena for the Bureau of Ships, U. S. Navy; application of studies to engineering roblems such as beach erosion, wave action on dam faces, harbor development, breakwater design, ydrographic surveying, etc.; methods of study and discussion on findings. *Subject Headings:* **. Ocean wave forecasting 2. Ocean wave measurement.**

5K–38 532.59

Rossby, Carl-Gustav, **Notes on the distribution of energy and frequency in surface waves** *Journal of Marine Research*, 6(2):93–103, **1947.** figs., 2 refs., 50 eqs. **DWB**—An attempt is made to determine the source of the wave energy in the long-wave forerunner of a train of plane surface gravity waves emanating from a point source. It is shown that a train of progressive surface waves in which the group velocity of the forward portion is less than that of the rear portion, may give rise to the formation of a sharp progressive wave front, in which the wave period increases with time *Subject Headings:* **1. Forerunners of swell 2. Ocean wave propagation theory 3. Ocean wave energy.**—*Author's summary.*

5K–39 532.59

Starr, Victor P., **A momentum integral for surface waves in deep water.** *Journal of Marine Research*, 6(2):126–135, **1947.** fig., refs., 15 eqs. **DLC**—With the hope that his conclusions might be "of significance in the study of wave growth due to wind action" the author shows that "there exists a simple relationship between the momentum and the kinetic energy" in the motion of irrotational and periodic surface waves of finite height under the influence of gravity. The equation derived states that "the kinetic energy per wave length and per unit distance along the crests of the waves is equal to one-half the wave speed multiplied by the momentum of the same water mass in the direction of wave propagation." *Subject Headings:* **1. Ocean wave energy 2. Ocean wave theory.**

5K–40 551.556:532.593:551.509.3

Sverdrup, Harald Ulrik and Munk, Walter H., **Wind, sea and swell: theory of relations for forecasting.** *U. S. Hydrographic Office, Technical Report*, No. 1, **1946.** H. O. Pub. No. 601. March **1947.** 44 p. 14 figs., tables, refs. **DLC**—Theory of surface waves. Propagation of a disturbance through a region previously undisturbed. Energy transfer from wind to waves. Theory for growth of waves, observations of the growth of waves, theory for decay of waves, and observation of decay of waves. Appendix contains observational wave data and summary. *Subject Headings:* **1. Ocean wave generation 2. Ocean wave propagation 3. Wind-wave energy transfer 4. Ocean wave decay.**—*M.R.*

5K–41 532.593:551.46

Sverdrup, Harald Ulrik, **Period increase of ocean swell.** *American Geophysical Union, Transactions*, 28(3):404–417, June **1947.** 7 figs., refs., 19 eqs. **DWB**—Assuming several basic characteristics of swell, it is shown that the air resistance which the swell encounters leads to a selective dissipation. The energy associated with the shorter period waves is dissipated more rapidly than that of the longer period waves, and consequently the energy maximum shifts toward longer periods; that is, the period of the significant waves increases. The effect is modified by following or opposing winds. Numerical examples are in satisfactory agreement with results from the semi-empirical graphs of Sverdrup and Munk. The energy considerations indicate numerous new possibilities for the interpretation of records of swell. *Subject Headings:* **1. Ocean wave energy 2. Ocean swell decay.**—*Author's abstract.*

1948

5K–42 551.556:532.593:551.509.3

Arthur, Robert S., **Forecasting Hawaiian swell from January 2 to 5, 1947.** *American Meteorological Society, Bulletin*, 29(8):395–400, Oct. **1948.** 3 figs., 2 tables, 2 refs. **DWB**—The adequacy of existing forecasting techniques is demonstrated for a situation involving extreme wave conditions on the northern shores of the Hawaiian Islands. Computations of wave characteristics are made from SVERDRUP and MUNK's revised relationships (*see* 5K–30 and 5K–40 above) show that this unusually high swell could be forecast more than 24 hours in advance. Travel time is computed on the basis of the group velocity at the end of the decay distance. The situation affords a particularly good check on computed travel time since the time of maximum wave height is observed at both the Hawaiian and Palmyra Islands. *Subject Headings:* **1. Ocean swell forecasting 2. Hawaiian Islands** —*Author's abstract.*

5K–43 551.556:532.59

Barber, N. F. and Ursell, F. (*Admiralty Research Lab.*), **The generation and propagation of ocean waves and swell. I. Wave periods and velocities.** *Royal Society of London, Philosophical Transactions, Ser. A*, 240(824):527–560, Feb. **1948.** 16 figs., tables, 12 refs., eqs. **DLC**—Wave amplitude and period data (from underwater recorders) are compared with meteorological charts of the ocean to assess the velocity of propagation of swell over long distances. In one case of simple meteorological conditions the velocity of propagation was within 5% of the value prescribed by hydrodynamical theory. Agreement less good for more complex conditions. Wave data compared wi

vind for 1) a depression in the North Atlantic, 2) a tropical storm off Florida and 3) a train of swell pparently originating near Cape Horn. *Subject Headings:* **1. Ocean wave generation 2. Ocean vave propagation 3. Underwater wave recorders 4. Ocean swell.**—*From authors' abstract.*

5K–44 551.465(261/4)

Bernard, Pierre, **Variation annuelle de la houle dans l'Atlantique nord et l'Atlantique sud.** [Annual variations in swell in the North Atlantic and the South Atlantic.] *Institut Oceanographique, Monaco, Bulletin*, 45(927), March **1948.** 8 p. 2 figs., 3 tables, 5 refs. **DWB**—Observations of well at stations ranging from Norway to Lomé (Africa) indicate that swell in both the northern and he southern hemisphere depends on the meteorological situation prevailing over the ocean and often riginates on the North Polar and Austral fronts respectively. An inverse relationship between well height recorded at Lomé (Southern Hemisphere) and Casablanca (Northern Hemisphere), with naximum heights occurring during winter at each, bears witness to the seasonal march of depressions n each hemisphere. *Subject Headings:* **1. Forerunners of swell 2. Ocean swell height 3. Atlantic Ocean.**

5K–45 551.465:551.509.39

*Darbyshire, J., **The prediction of wave spectra on the North Coast of Cornwall.** *Teddington, England. (Admiralty) Research Laboratory, ARL*/R10/103.41/W, May **1948.** 22 p. 21 figs., tables. **DN-NO**—Strength and duration of wind in North Atlantic storms are correlated with eriods of the longest and highest waves and with the mean wave height. Relations serve as basis or empirical formula giving wave-energy per unit area of sea surface associated with a particular vave period in terms of the wind speed, wave period and time wind has acted on waves. Formula ives fairly reliable wave spectrum forecasts for both local and distant storms. Methods may need erious modification for other less exposed areas with different bottom configuration. *Subject Headings:* **1. Ocean wave spectra 2. Ocean wave forecasting 3. Cornwall, England. I. Great Britain. Admiralty Research Laboratory.**

5K–46 551.465:551.515

Hamill, Estill L., **Application of the method for tracking storms by forerunners of swell.** Calirnia. University. Scripps Institution of Oceanography, Contract N6 ori-111, Wave Report, No. 77, March **1948.** 7 p. 2 figs., table, graphs, 2 refs. **DWB**—A test of Munk's 1947 method (see 5K–36 above) using analyzed weather maps for the North Atlantic and wave spectrograms rom Pendeen, England. Distribution of errors in 20 test cases (14 of which gave good results) abulated. Best results obtained from warm lows. Cold lows gave poor results. The two types vere distinguishable by inspection of the wave spectrum. Computed storm speeds averaged 15% n error. *Subject Headings:* **1. Ocean storm forecasting 2. Forerunners of swell 3. North Atlantic Ocean. I. California. University. Scripps Institution of Oceanography II. Contract N6ori-111.**

5K–47 551.465:551.481.1

*Johnson, J. W., **The characteristics of wind waves on lakes and protected bays.** *American Geophysical Union, Transactions*, 29(5):671–681, Oct. **1948.** 11 figs., table, 4 refs., eqs. **DLC**—Results of investigations to determine height and period of waves generated by wind blowing over akes, reservoirs, or bays, protected from ocean swell, are given. Some information is presented on he variability of wave length and crest length as a function of fetch in the generating area. Further nvestigation urged. (*Same item as* 11–111, Nov. 1950, *MAB.*) *Subject Headings:* **1. Wind-wave energy transfer 2. Lakes.**—*From author's abstract.*

5K–48 532.593:551.465

*Johnson, Joe William; O'Brien, M. P. and Isaacs, J. D. (*Univ. of California, Berkeley*), **Graphical construction of wave refraction diagrams.** *U. S. Hydrographic Office, Publication*, No. 605, Jan. **1948.** 45 p. 33 figs., tables, refs., eqs. Append. **DWB**—A refraction diagram is a map "showing the vave crests at a given time, or the successive positions of a particular wave crest as it moves shoreward." Procedures for constructing such diagrams by the wave front method and directly from orthogonals (set of lines everywhere perpendicular to the wave crests) are outlined. Several case studies of diagram construction and numerous photographic plates illustrating refraction are included. Appendix comprises a summary of the theory and plotting data for refraction scales. *Subject Heading:* **1. Ocean wave refraction diagrams.**

5K–49 551.556:532.593

Neumann, Gerhard, **Über den Tangentialdruck des Windes und die Rauhigkeit der Meeresoberfläche.** [On the tangential stress of the wind and the roughness of the sea surface.] *Zeitschrift für Meteorologie*, 2(7/8):193–203, July/Aug. **1948.** 8 figs., 4 tables, 30 refs., eqs. (See also *Idem.*, **Die Meeresoberfläche als hydrodynamische Grenzfläche und das Windfeld über den Wellen.**

[The sea surface as a hydrodynamic boundary and the wind field over waves.] *Annalen der Me teorologie*, 2(5–6):156–164, May–June **1949.**) **DWB**—Using water level observations from th Baltic Sea, Gulf of Bothnia and various lakes, author derives empirical formula τ [dyn cm^{-2}] = 11. $\times 10^{-5}$ $v^{3/2}$ (where τ is wind stress on the water surface and v is wind speed measured at 6m abov sea surface). The coefficient of friction is shown to decrease with increasing wind speed. Attemp made to explain this law by the dependence of the wave shape on wind speed. *Subject Headings* **1. Tangential wind stress 2. Ocean wave generation.**

5K–50 532.593:551.46

Putnam, J. A. and Arthur, Robert S., **Diffraction of water waves by breakwaters.** *America Geophysical Union, Transactions*, 29(4):481–490, Aug. **1948.** 11 figs., 5 refs., 17 eqs. **DWB**— Application is made of a solution of the water-wave diffraction problem of Penny and Price t diffraction by a semi-infinite impermeable breakwater. Approximations are introduced to simplif application of the theory. Comparison of complete and simplified solutions is made with result obtained from a laboratory investigation. Best agreement between theory and experiment occurre in the lee of the breakwater. The simplified solution is shown to be adequate for most practica applications. Also as California. Univ. Scripps Institution of Oceanography, (New series Contributions, No. 371. *Subject Heading:* **1. Ocean wave diffraction.**—*Authors' abstract.*

5K–51 551.556:532.5

Roll, Hans U., **Wassernahes Windprofil und Wellen auf dem Wattenmeer.** [Wind profi and waves over shallow water.] *Annalen der Meteorologie*, 1(4/5):139–151, April/May **1948.** 8 fig tables, refs., eqs. **DWB**—Wind profile above the (Neuwerker) shoals can be represented by logarithmic curve without a kink, indicating the sea surface to be a smooth rather than a roug boundary surface. Roughness values shown to decrease as shearing stress increases, for valu above 10 cm/sec. A relationship between the high roughness values over the sea and the wa forms could not be determined. Possible explanations are given for the discrepancy between t author's results and prior measurements of Wüst and Bruch. Investigation shows that even f relatively steep waves the tangential wind stress is more effective than the normal pressure forc Low values of roughness and shearing stress over shoal water lead to the conclusion that the wi itself creates a stabile boundary surface through the stimulation of wave motion. *Subject Heading* **1. Wind profile above the sea 2. Wind-wave energy transfer 3. Tangential wind stress.**

5K–52 551.556:532.5

Roll, H. U., **Das Windfeld über den Meereswellen.** [The wind field above the sea waves *Naturwissenschaften*, Berlin, 35(8):230–234, **1948.** 3 figs., 14 refs., eqs. **DLC**—Author conclud from observations over shoals that the wind profile up to 2 meters is not influenced by the heig of the waves. The sea surface roughness is considered as a constant in the equations descripti of the wind profile in this layer. Roughness is a function of wind velocity and shearing stress, n of wave height. Wave generation thought to depend more on tangential stress than on pressu *Subject Headings:* **1. Wind-wave energy transfer 2. Ocean wave theory 3. Wind field above t ocean 4. Tangential wind stress.**

5K–53 551.55:532

Rubčić, Edo R., **Valovi na moru.** [Ocean waves.] *Split, Yugoslavia. Hidrografski Insti Mornarice. Meteorologski Otsjek, Vremenske Prilike*, 3(1/2):25–29, July **1948.** 9 figs. **DWB** Knowledge on ocean waves (trochoidal motion of particles), on their elements (length, height, perio propagation), on their generation, decay and breaking is summarized. Waves caused by ear quakes, and stationary waves are also discussed. *Subject Headings:* **1. Ocean wave theory 2. Oce wave characteristics.**—*G.T.*

5K–54 551.501:551.4

*Seiwell, H. R., **Evaluation of sea surface roughness from underwater pressure recordin** *American Geophysical Union, Transactions*, 29(2):197–201, April **1948.** 5 figs., 3 tables, 3 re 2 eqs. **DLC**—Average and modal values of wave heights and wave periods together with stand deviations and probable errors are tabulated for each month from 639 Cuttyhunk underwa pressure fluctuation recordings (July 1946 to May 1947) and 1022 Bermuda recordings (Feb. to M 1947). Relationships between the average wave height and period, average of the highest one-th waves, highest waves and wave steepness are also shown. Also as *Woods Hole Oceanograp Institution, Contribution*, No. 407. *Subject Headings:* **1. Underwater wave recorders 2. Oc wave height data 3. Ocean wave period data 4. Cuttyhunk, Mass. 5. Bermuda.**—*From auth abstract.*

5K–55 551.465(261/4)

*Seiwell, H. R., **Results of research on surface waves of the western North Atlantic. I. Investigation of bottom pressure fluctuations and surface waves. II. Results of sea surface roughness determinations in the vicinity of Woods Hole, Massachusetts and Bermuda.** *Papers in Physical Oceanography and Meteorology*, Cambridge, Mass., 10(4), Aug. **1948.** 56 p. 41 figs., 22 tables, 5 eqs. **DWB**—In Pt. I, "theoretical sea surface wave heights computed from amplitudes and periods of bottom pressure fluctuation (recorded off Bermuda and Cuttyhunk by the underwater pressure meter) were compared with observed heights and periods of waves at the overlying sea surface. Evaluation of differences between observed and theoretical values permits computation of empirical correction factors and their probable errors." Data included. Pt. II comprises data on the state of the sea surface off Cuttyhunk (near Woods Hole) July 1946–May 1947 and off Bermuda, Feb. 1947–May 1947 obtained from analyses of automatic wave recordings. Interrelationships of wave characteristics discussed. Also as *Woods Hole Oceanographic Institution, Contribution*, No. 436. *Subject Headings:* **1. Underwater wave recorders 2. Ocean wave data 3. Bermuda 4. Cuttyhunk, Mass.**

5K–56 532.593

Starr, Victor P., **Estimates of water transport produced by wave action.** *Journal of Marine Research*, 7(1):1–9, **1948.** table, 3 refs., 22 eqs., append. **DWB**—The surface wave problem is brought under the general scope of the classical theory of the motions of solids through liquids to explain the existence of theoretical integral relationships for periodic surface gravity waves in a basin of great depth. A table giving the magnitude of the water transport in specific cases is included. *Subject Headings:* **1. Ocean wave theory 2. Hydrodynamics 3. Water transport in waves.**

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5K–57 532.593:551.465

Abdullah, Abdul Jabbar, **Wave motion at the surface of a current which has an exponential distribution of vorticity.** *New York Academy of Sciences, Annals*, 51(3):425–441, May **1949.** 2 figs., tables, 6 refs., 60 eqs. **DLC**—In this paper, a first attempt is made towards a solution of wave motion superposed on a current which is caused by winds. The current is assumed to follow the EKMAN spiral in speed but to remain constant in direction. Frequency equations are derived in the form of series solutions, and approximate computations on the basis of these series are made. The stability of surface waves is also discussed, the assumption being made that the wind velocity is constant with height. *Subject Headings:* **1. Wind driven currents 2. Ocean wave theory. I. Haurwitz, B.** (*ed.*).—*From author's summary.*

5K–58 532.593:551.465

Arthur, Robert S., **Variability in direction of wave travel.** *New York Academy of Sciences, Annals*, 51(3):511–521, **1949.** 8 figs., 6 refs., 3 eqs. (Discussion by W. L. Donn, p. 521–22.) **DLC**—"Within a fetch, waves may be expected to grow, even though they are moving at angles of as much as 45° with the wind direction. The height of such waves will be at least 50% of the height of waves moving with the wind. Within the fetch, the waves moving with the wind or at small angles to the wind appear dominant, but waves moving at larger angles are important when a wave train is interrupted by an island or headland. Variability in direction of swell can be determined by considering the different paths in the fetch which are directed toward the point where swell is to be considered. Variability usually decreases with increasing decay distance." Dr. W. L. DONN suggests that this theory of deviation of waves from wind direction might explain some otherwise unaccountable waves observed near Woods Hole, Mass., in the course of an experiment relating synoptic weather maps and ocean waves. *Subject Headings:* **1. Ocean wave travel direction 2. Ocean swell travel direction. I. Haurwitz, B.** (*ed.*).

5K–59 551.465:551.509.39

Bates, Charles C., **Utilization of wave forecasting in the invasion of Normandy, Burma, and Japan.** *New York Academy of Sciences, Annals*, 51(3):545–569, **1949.** 13 figs., 3 tables, 13 refs. **DLC**—"Forecasting of sea, swell, and surf conditions in quantitative terms developed during the early part of World War II and reached maturity within three short years. The techniques were basically correct and could be modified by meteorologists trained in the methods to provide reliable forecasts for amphibious operations wherever they might be held." The value of the information is obvious from its contributions to the success of the Normandy invasion. *Subject Headings:* **1. Amphibious operations 2. Ocean wave forecasting 3. Normandy 4. Burma 5. Japan. I. Haurwitz, B.** (*ed.*).

5K–60 551.556:532.593

Deacon, G. E. R., **Recent studies of waves and swell.** *New York Academy of Science, Annals*, 51(3):475–482, **1949.** 4 figs., 4 refs. **DLC**—Brief mention is made of wave generation and propaga-

tion. Effects of following winds and tidal streams are considered. A few empirical rules for wav prediction are followed by a short discussion of the practical applications of swell recording. Th close relationship between wind-wave and microseism spectra is commented upon and illustrate diagrammatically. See also: *Idem.*, **Waves and swell.** *Royal Meteorological Society, Quarterl Journal*, 75(325):227–238, **1949.** *Subject Headings:* **1. Ocean wave forecasting 2. Ocean wav theory 3. Ocean swell. I. Haurwitz, B.** (*ed.*).

5K–61 551.465:551.51

Deacon, G. E. R., **Storm warnings from waves and microseisms.** *Weather*, 4(3):74–79, Marc **1949.** 3 figs., 2 plates, 10 refs. **DLC**—Summarizes experience to date in obtaining informatio about waves and storms from seismograph records. Concluded that microseismic records are o definite value in locating storms and determining their intensity. Microseismic periods found to b half the wave periods. *Subject Headings:* **1. Microseisms from ocean waves 2. Microseism storm tracking.**

5K–62 551.465(261/

Donn, William L., **Studies of waves and swell in the western North Atlantic.** *American Ge physical Union, Transactions*, 30(4):507–516, Aug. **1949.** 8 figs., 3 tables, 13 refs. **DLC**—Wav and swell recorded with an underwater meter fall into two groups having relatively short (5.5–1 sec.; associated with prevailing southerly winds) and long periods, respectively. Study of the lon period swell suggests a more distant origin, with indications that ocean swell travels with constan period and group velocity. Some general rules relating to storm positions and observed swell a derived from the wave and weather data associated with two Atlantic storms. *Subject Heading* **1. Underwater wave recorders 2. Ocean swell 3. Western North Atlantic.**—*From author's abstra*

5K–63 532.593:551.4

Ewing, Maurice and Press, Frank, **Notes on surface waves.** *New York Academy of Scienc Annals* 51(3):453–462, May **1949.** 7 figs., 13 refs., 4 eqs. **DLC**—Certain problems in the study waves by subsurface pressure measurements are discussed. A brief review is presented of some poin in classical theory which have been subject to misunderstanding in recent literature of surface wav Lastly a proposed investigation of the swell and microseisms generated by intense storms is outline *Subject Headings:* **1. Ocean wave theory 2. Underwater wave recorders. I. Haurwitz, B.** (*ed.*).

5K–64 551.501:551.4

Folsom, R. G., **Measurements of ocean waves.** *American Geophysical Union, Transactio* 30:691–699, **1949.** 6 figs., table, eqs., 7 refs. **DWB**—Laboratory and field investigations demo strate that theoretical pressure ratios for pressure wave recorders are correct to within 10 20%. The theoretically corrected measured wave heights in shallow water are low. Univers of California Mark III and Mark V wave recorders are described and records from latter reproduce Limitations of available information on spar buoy damping disc systems for deep water wave measu ments are summarized. *Subject Heading:* **1. Ocean wave measurement.**—*Author's abstract.*

5K–65 551.556:532.5

Francis, F. R. D., **Laboratory experiments on wind-generated waves.** *Journal of Mar Research*, 8(2):120–131, **1949.** 4 figs., 3 tables, refs. **DWB**—Experiments were conducted annular channels up to a size of 6 feet in diameter and one H.P. input. A radical change in wa shape in the range 24–26 ft/sec showed fairly close agreement with MUNK's (*see* 5K–35 abov critical wind speed of 21.7 ft/sec. The effect of irregularity in the air flow on wave development a the existence of lee eddies in wave troughs were investigated. *Subject Headings:* **1. Ocean wa laboratory experiments 2. Critical wind velocity.**

5K–66 551.556:532.593:551.465(

Groen, P., **Zeegolven.** [Sea waves.] *Netherlands. K. Meteorologisch Instituut, No. 1 Opstellen of Oceanografisch en Maritiem Meteorologisch Gebiet*, [No.] 11, **1949.** 82 p. figs., bibli **DWB**—A clear, comprehensive review of sea wave phenomena. The basic mathematical expressi are given and many diagrams showing the mathematical relationships illustrate the text. structive aerophotos are given. The author begins with simple and complex waves, describes observations and methods and discusses the development of sea disturbance and swell, and w changes near the coast. *Subject Headings:* **1. Ocean wave theory 2. Nomograms 3. Textboo** —*A.A.*

5K–67 551.465(2

*Harney, L. A., Saur, J. F. T., Jr. and Robinson, A. R., **A statistical study of wave conditi at four open-sea localities in the North Pacific Ocean.** *U. S. National Advisory Committee*

eronautics, Technical Note, No. 1493, Jan. 1949. 28 p. 11 figs., 9 tables, 6 refs. **DN-HO**—A tudy of a) wave height and frequency, b) wave length-height ratio and frequency, c) wave velocity nd its relation to wave lengths, d) wind velocity, and e) wave shape in four different open-sea ocalities in the Pacific. Percentage frequencies of wave heights and wave length-height ratios alculated by use of weather maps. Methods developed for forecasting sea and swell. Comparison etween computed and observed heights was satisfactory. *Subject Headings:* **1. Ocean wave height ata 2. Ocean wave length data 3. Pacific Ocean.**—*From author's abstract.*

5K–68 551.465:551.509.5

Isaacs, John D. and Saville, Thorndike, Jr., **A comparison between recorded and forecast waves n the Pacific Coast.** *New York Academy of Science, Annals*, 51(3):502–510, 1949. 2 figs., 18 refs., q. **DLC**—Brief description given of installation and operation of wave recorders in California and Washington. Actual comparison of recorded with forecast values was, in general, good but would e even better if fetch could be more accurately determined and if more weather reports south of 30°N ere available. Wave forecasting is particularly reliable in regard to increases in wave height. *ubject Headings:* **1. Ocean wave forecasting 2. Ocean wave recorders 3. California 4. Wash-ngton 5. Eastern North Pacific Ocean. I. Haurwitz, B.** (*ed.*).

5K–69 551.465:551.501

Isaacs, J. D. and Wiegel, R. L., **The measurement of wave heights by means of a float in an pen-end pipe.** *American Geophysical Union, Transactions* 30(4):501–506, Aug. 1949. 6 figs., ef., 6 eqs., append. **DWB**—The problem of resonance in open-end pipes with float-type recorders s such as to render such pipes impractical for the measurement of ocean waves affecting coastal ngineering structures. *Subject Heading:* **1. Ocean wave height measurement.**

5K–70 551.556:551.46:532.59

Kapitsa, P. L., **K voprosu ob obrazovanii vetrom morskikh voln.** [On the question of the ormation of wind waves at sea.] *Akademiia Nauk SSSR, Doklady*, 64(4):513–516, 1949. 5 refs. **DWB**—Consideration of difference of pressure on two sides of a wind-wave gives theoretical results lose to the experimental. (*Same item as* 7–77, July 1950, *MAB.*) *Subject Heading:* **1. Ocean wave eneration.**—*M.R.*

5K–71 532.593:551.465

Mason, M. A. (*Beach Erosion Bd., U. S. Army Engineers*), **Ocean wave research and its en-ineering applications.** *New York Academy of Science, Annals*, 51 (3):523–532, 1949. **DLC**—Discussion of application of wave knowledge to the design and operation of ships, location and ayout of harbors and breakwaters, shore protection, and military operations. *Subject Headings:* **. Ocean wave research 2. Marine industry. I. Haurwitz, B.** (*ed.*).

5K–72 532.592:551.465

Keller, Joseph B., **The solitary wave and periodic waves in shallow water.** *New York Academy f Science, Annals*, 51(3):345–350, 1949. 3 figs., 9 refs., 3 eqs. **DWB**—Waves of permanent type n shallow water are discussed by a method which "consists in expanding the solution of the exact ydrodynamic problem systematically in powers of a dimensionless parameter $\sigma = (\omega h)^2$ where h is he depth of the undisturbed fluid and ω is the curvature at some point on the surface. The ex-ansions are inserted into the equations of motion and the boundary conditions, and coefficients of ike powers of σ are equated. The variables are chosen in such a way that the terms of zero order n the expansion in powers of σ satisfy the well-known equations of the nonlinear shallow water heory which are analogous to the equations of gas dynamics." *Subject Headings:* **1. Solitary wave heory 2. Shallow water wave theory. I. Haurwitz, B.** (*ed.*).

5K–73 551.465:551.46.018

Klebba, Arthur A. (*Woods Hole Oceanographic Institution*), **Details of shore-based wave re-order and ocean wave analyzer.** *New York Academy of Science, Annals*, 51(3):533–544, 1949. 2 figs., 3 refs. **DLC**—Description of a self-powered, continuous operating, shore-recording under-vater unit capable of recording waves in depths of water to 150 feet. Instrument was developed t Woods Hole along lines promulgated by the British (see BARBER, URSELL et al., 1946 above) nd was installed off Bermuda in 1946. Also as *Woods Hole Oceanographic Institution, Contribution*, No. 438. *Subject Headings:* **1. Ocean wave measurement 2. Underwater wave recorders . Oceanographic instruments. I. Haurwitz, B.** (*ed.*).

5K–74 551.465

Munk, Walter H., **Surf beats.** *American Geophysical Union, Transactions*, 30(6):849–854, Dec. 1949. 4 figs., 2 tables, 7 refs. **DWB**—Discusses records obtained with a tsunami recorder period 2–3 min) 1,000 ft. offshore at La Jolla and a swell recorder (period 7–9 sec) 2,000 ft offshore.

Tsunamis are irregular oscillations of about 2 min period due to groups of waves integrated on shor and reflected. Their amplitude averages 1/11 that of swell. (*Same item as* 2.8-188, Aug. 1951 *MAB.*) *Subject Headings:* **1. Tsunamis 2. Ocean swell 3. Surf beats.**—*C.E.P.B.*

5K–75 532.593:551.46

*Munk, Walter H. (*Scripps Institution of Oceanography*), **The solitary wave theory and its ap plication to surf problems.** *New York Academy of Science, Annals*, 51(3):376–424, **1949.** 10 figs 12 plates, 5 tables, 25 refs., 77 eqs., 2 appends. **DLC**—Paper purports (a) to give a summary o useful relationships derived by means of the solitary wave theory, and to plot these relationship using dimensionless parameters for the purpose of making the theory accessible to numerical ex amples; (b) to review various studies at the Scripps Institution dealing with the application of thi theory, to surf problems; and (c) to discuss the problem of sand transport in or near the surf zon in the light of the solitary wave theory. The investigation represents part of a general projec undertaken during the war for the purpose of providing useful wave forecasts for the amphibiou forces. *Subject Headings:* **1. Solitary wave theory 2. Surf. I. Haurwitz, B.** (*ed.*).—*From author introduction.*

5K–76 551.556:551.46

Neumann, Gerhard, **The generation of water waves by wind.** *U. S. Beach Erosion Boar Bulletin*, 6(1):26–29, Jan. 1, 1952. tables, graph. Abstract of English translation of original i German from *Deutsche Hydrographische Zeitschrift*, 2(5):187–199, **1949. DWB**—"Theory presente for computing length and amplitude of initial waves generated by incident winds of different ve locities, which is valid until the initial waves attain a steepness where they are no longer stable an turbulence occurs. . . ." Any wind with velocity >69.5 cm/sec is capable of generating waves, an combined effect of capillarity and gravity produces two separate wave trains. Computation mad for various wind speeds and for shallow water layers or where wave length is >water depth. (*Sam item as* 4.4–171, April 1953, *MAB.*) *See also: Idem.*, **On wind generated ocean waves with speci reference to the problem of wave forecasting.** New York University, College of Engineering, Depar ment of Meteorology, May 1, 1952. *Subject Headings:* **1. Ocean wave generation 2. Shallow wate wave theory 3. Wind-wave energy transfer.**—*M.R.*

5K–77 532.593:551.46

*Putnam, J. A. and Johnson, J. W., **The dissipation of wave energy by bottom friction.** *America Geophysical Union, Transactions*, 30(1):67–74, Feb. **1949.** 3 figs., 4 tables, refs. **DLC**—A theor is developed for the loss in wave energy as a result of friction by the oscillating motion of waves a the sea bottom. Loss of energy is reflected as a reduction in wave height as the waves move shor ward. *Subject Headings:* **1. Ocean wave energy 2. Ocean wave decay.**—*From authors' abstract.*

5K–78 551.556:551.465(261.

Roll, Hans-Ulrich, **On the expansion of sea waves due to the effect of wind, based on measur ments in shallow tidal waters.** *U. S. Beach Erosion Board, Bulletin*, 6(1):22–25, Jan. 1, 195 graphs. Abstract of English translation of German original from *Deutsche Hydrographische Ze schrift*, 2(6), **1949. DWB**—Wind and wave measurements made in tidal waters of Neuwerk Shallow in North Sea at the mouth of the Elbe River are described and compared with theoretical resul based on SVERDRUP and MUNK. Empirical relation between steepness and wave age shows wi scatter which may indicate the youngest waves assume a considerable increase in steepness im mediately after formation. Influence of fetch on wave heights and age, according to SVERDRU and MUNK, is compared with Neuwerk measurements and agreement indicates that Sverdrup-Mu theory of growth of sea waves due to wind is valid. (*Same item as* 3.8–132, Aug. 1952, *MAB Subject Headings:* **1. Wind-wave energy transfer 2. Shallow water wave theory 3. Ocean wa propagation 4. North Sea. I. Sverdrup, Harold Ulrik II. Munk, Walter H.**—*M.R.*

5K–79 551.465(261/

Schubart, Ludwig and Möckel, Walter, **Dünungen im Atlantischen Ozean.** [Swell in t Atlantic Ocean.] *Deutsche Hydrographische Zeitschrift*, 2(6):280–285, Dec. **1949.** 5 figs., re **DWB**—Frequencies of direction and force of swell (Douglas scale) are given from ship records f six characteristic regions of the Atlantic Ocean. Influences of geographical and meteorologic conditions recognizable in the frequencies of swell direction for various regions but no predomina direction tendency found for Atlantic as a whole. Frequency curves of swell force in all regio show considerable conformity, their apexes always coinciding with the minor steps of the sca For the whole Atlantic a very uniform distribution of swell force is shown to exist. *Subject Heading* **1. Ocean swell travel direction 2. Ocean swell height 3. Atlantic Ocean.**—*Authors' abstract.*

5K–80 532.593:551.465

Seiwell, H. R., **Sea surface roughness measurements in theory and practice.** *New York cademy of Sciences, Annals,* 51(3):483–500, **1949.** 8 figs., 3 tables, 6 refs. **DWB**—Plea for ientific, direct observations of the sea surface with reference to the urgent needs of the military. lethods for measuring sea surface roughness and some significant results of such measurements off ermuda and Cuttyhunk (*see* 5K–55 above) are given. Growth and decay of waves, interrelation- ips of wave characteristics, determination of operational wave heights from average wave heights id sea surface roughness factors in relation to design are discussed. Also published as *Woods ole Oceanographic Institution, Contribution,* No. 435. *Subject Heading:* **1. Ocean wave measure- ent. I. Haurwitz, B.** (*ed.*).

5K–81 532.593:551.465

Seiwell, H. R. and Wadsworth, George P., **A new development in ocean wave research.** *Science,* ew York, 109:271–274, **1949.** 6 figs., 3 refs., eqs. **DLC**—The authors contend that the wave- ands construed by Sverdrup and Munk as constituting the oceanic wave pattern have no realistic hysical significance. The authors' own method of "generalized harmonic analysis" leads them to onclude that a wave record is composed of a predominant sinusoidal wave with superimposed ndom oscillations. By this method the cyclical component (dominating oceanic meteorological tuation) may be separated from the oscillatory components (local winds and other local dis- rbances) and the physical properties of each determined. *Subject Headings:* **1. Ocean wave theory . Harmonic analysis of waves.**

5K–82 532.593:551.465

Stoker, James J., Jr., **The breaking of waves in shallow water.** *New York Academy of Science, nnals,* 51(3):360–275, **1949.** 12 figs., refs., 12 eqs. **DLC**—The breaking of waves along a shallow each is discussed from the mathematical point of view using an approximate theory derived from ie basic hydrodynamics of irrotational non-viscous flow (shallow water theory). Development of dal bores included in discussion. *Subject Headings:* **1. Breakers 2. Tidal bores 3. Ocean wave eory. I. Haurwitz, B.** (*ed.*).

5K–83 551.506:551.465

Suthons, C. T., **Observation of ocean waves.** *Marine Observer,* 19(144):88–99, April **1949.** 9 gs., photos. **DWB**—Dimensions and basic movement of an ocean wave explained. Methods of easuring mean period, height and direction of sea and swell from shipboard discussed. *Subject eading:* **1. Ocean wave measurement.**

5K–84 532.593

Thompson, Philip Duncan, **The propagation of small surface disturbances through rotational ow.** *New York Academy of Sciences, Annals,* 51(3):463–474, May **1949.** 2 refs., 15 eqs. **DLC**— he paper is a theoretical analysis of the "propagation and the phase speed of small periodic dis- rbances travelling through a current whose initial, undisturbed motion is rotational. A method nalogous to 'fairly shallow water' theory is proposed for finding approximate values of wave speed rotational flow." The theory of irrotational waves is briefly reviewed. Simple examples of otational waves are included to illustrate a multi-layer method for finding the approximate values f wave speed through a current in which the distribution of undisturbed flow is arbitrary. Long otational waves and limiting values of phase speed are also discussed. *Subject Headings:* **1. Ocean ave propagation 2. Irrotational wave theory. I. Haurwitz, B.** (*ed.*).

5K–85 551.506:551.465

Wiegel, R. L., **An analysis of data from wave recorders on the Pacific coast of the United States.** *merican Geophysical Union, Transactions,* 30(5):700–704, Oct. **1949.** 6 figs., 6 refs. **DWB**— omparison of wave heights and periods from wave recorders off Point Sur, California, and Heceta ead, Oregon (April 1947 to June 1948) plus additional data from Point Arguello, California, showed at the ratio of the maximum wave recorded each date to the highest 10% for that day was 1.46 nd the ratio of the average of the highest 10% to the average of the highest one-third of the waves ch day was 1.29. Average period of swell (excluding local "chop") was 12 seconds. *Subject eadings:* **1. Ocean wave height measurement 2. Ocean swell 3. Pacific Coast, United States.**— *-From author's abstract.*

5K–86 551.556:551.46:532.593

Wuest, Walter, **Wasser, Wind und Wellen. Eine physikalische Begründung ihres Zusam- enspiels.** [Water, wind and waves. A physical analysis of their correlation.] *Umschau,* rankfurt a.M., 49(18):556–558, Sept. **1949.** 4 figs. **DLC**—The formation of various types of aves with intermittent and constant wind is examined and several theories and experiments briefly

discussed. In the author's approach, wind velocity, surface tension, gravity, air density and dept of water are considered. Schematic drawings and photos illustrate the formation of regular an irregular waves in natural and artificial conditions. *Subject Headings:* **1. Ocean wave generatio 2. Wind-wave energy transfer 3. Hydrodynamics.**—*G.T.*

1950

5K–87 532.593:551.4

Arthur, Robert S., **Refraction of shallow water waves: the combined effect of currents an underwater topography.** *American Geophysical Union, Transactions*, 31(4):549–552, Aug. 195 3 figs., 12 refs., 5 eqs. *California. University. Scripps Institution of Oceanography, Contribution New Series*, No. 470. **DWB**—Solution given for determining the refraction effect according Fermat's principle for the case of shallow water waves moving in any given distribution of curre and depth. Application is made to an analytic model of an intense rip current, and the resul compared to actual rips. (See also: Munk, W. H. and Traylor, M. A., **Refraction of ocean wave a process linking underwater topography to beach erosion.** *Journal of Geology*, 55(1):1–26, 1947 *Subject Headings:* **1. Ocean wave refraction 2. Rip currents 3. Ocean wave theory.**—*Author abstract.*

5K–88 551.515:551.556:551.4

Arthur, Robert S., **Wave and weather correlation at Apra Harbor, Guam, M. I., from 1 June 30 November, 1949.** California. University. Scripps Institution of Oceanography, Contra N6ori-111, Task 6, Wave Report, No. 96, **1950.** 6 leaves. 3 figs., 3 refs. **DPL**—Five situatio were studied, three of which involved wind waves or swell from typhoons, and two involved cyclon more than 1,000 mi from Guam. The computed build up and decrease in wave heights agree wi observations. More wind data are needed from typhoon areas, however, if height of damagi waves are to be forecast accurately. When waves reach Guam with little or no decay from typho areas, the periods are much longer than forecast. (*Same item as* 11–107, Nov. 1950, *MAB.*) Als Miller, Robert L., **Wave and weather correlation at Apra Harbor, Guam, M. I., from March 18 May 31, 1949.** California. Univ. Scripps Institution of Oceanography, Contract N6ori-111, Ta 6, Wave Report, No. 90, Dec. **1949.** *Subject Headings:* **1. Ocean wave heights 2. Ocean wa forecasting 3. Ocean swell forecasting 4. Typhoons 5. Guam 6. Pacific Ocean. I. Califorr Univ. Scripps Institution of Oceanography II. Contract N6ori-3, Task 6.**—*M.R.*

5K–89 551.556:532.5

Arthur, Robert S., **Wave forecasting and hindcasting.** *Conference on Coastal Engineering, I Oct.* **1950,** *Long Beach, California, Proceedings*, p. 82–87, 3 figs., table, refs. Also in: *Californ Univ. Scripps Institution of Oceanography, Contribution, n.s.* No. 530, **1950. DWB**—Discussion confined to a brief consideration of 1) forecasting sea and swell, 2) the significance and applicati of the forecast, and 3) hindcasting and its applications. See also: Burt, Wayne V. and Saur, J. F. Jr., **Hindcasting technique provides statistical wave data.** *Civil Engineering*, N. Y., 18:733–7 Dec. **1948.** 2 figs., table, ref. *California. Univ. Scripps Institution of Oceanography, Contri tions, n.s.* No. 354; and Arthur, R. S., **Revised wave forecasting graphs and procedures.** Californ Univ. Scripps Institution of Oceanography, Contract N6ori-111, Wave Report No. 73, March 19 *Subject Headings:* **1. Ocean wave forecasting. I. California. Univ. Scripps Institution of Ocea ography II. Contract N6ori-111.**—*From author's introduction.*

5K–90 551.509.3(26) 551.556:532.5

Blot, C., **La prevision météorologique de l'"Etat de mer."** [Meteorological forecast of t "state of the sea."] *La Météorologie*, 4th Ser., No. 17:19–28, Jan.–March **1950.** 7 figs., tab Summaries in French, English and Spanish p. 19. **MH-BH**—A brief, instructive article on met hydrography (the author's term for the science of wind waves at sea). After a discussion of t theory and the parameters to be observed, an example of a forecast made from synoptic charts of North Atlantic (June 21–22, 1949) is given and the verification discussed. (*Same item as* 11–1 Nov. 1950, *MAB.*) *Subject Headings:* **1. Marine meteorology 2. Ocean wave forecasting 3. No Atlantic.**—*M.R.*

5K–91 551.465:550

Darbyshire, J. (*Royal Naval Sci. Serv.*), **Identification of microseismic activity with sea wav** *Royal Society of London, Proceedings, Ser. A*, 202(1070):439–478, Aug. **1950.** 6 figs., refs. **DL** Examination of three series of simultaneous wave and microseism records clearly indicates t bands of microseismic waves from different sources can be distinguished by frequency analy Microseismic waves of different periods appear to travel independently. Observation of a two one ratio between the period of waves and microseisms "affords some confirmation of the the

iat microseisms are produced in a region of interference between similar wave trains travelling in ›pposite directions either near the coast or in deep water." *Subject Heading:* **1. Microseisms from :ean waves.**

5K–92 532.593:551.465

Dunham, James W., **Refraction and diffraction diagrams.** *Conference on Coastal Engineering, t, Oct.* **1950,** *Long Beach, California, Proceedings*, p. 33–49, pub. 1951. 7 figs., 9 refs., eqs. **DWB**—rief review of the principles and procedures for constructing refraction and diffraction diagrams id a description of their practical application by the Corps of Engineers, Los Angeles District. or applications to design of breakwaters, see **Generalized wave diffraction diagrams** by J. W. OHNSON in *Ibid., Second Conference, Houston, Texas, Nov.* **1951,** p. 6–23, pub. 1952. *Subject Head-gs:* **1. Ocean wave refraction diagrams 2. Ocean wave diffraction diagrams.**

5K–93 532.593:551.465

Groen, P. and Dorresstein, R., **Ocean swell: its decay and period increase.** *Nature*, London, 55(4194):445–447, March 18, **1950.** fig., 7 refs., 4 eqs. **DWB**—Authors compute swell decay and eriod increase on the basis of eddy viscosity considerations rather than air resistance as did SVER-RUK and MUNK (*see* 5K–39, –40, –41 above). *Subject Headings:* **1. Ocean swell decay 2. Eddy scosity.**

5K–94 551.46:532.59

Groen, P. and Weenink, M. P. H., **Two diagrams for finding breaker characteristics along a traight coast.** *American Geophysical Union, Transactions*, 31(3):398–400, June **1950.** 2 figs., refs., 4 eqs. **MH-BH**—The authors describe the method for determining by successive approxi-ation the characteristics of the breakers and surf from a knowledge of the bottom topography of ie shallow water and from the conditions of sea and swell in the deep waters off a coast. Two agrams are presented, one for obtaining the breaker height and the other the breaker angle from ie initial steepness and the crest angle in deep water. The characteristics of breakers for the case sufficiently straight and parallel bottom contours can be read directly from these diagrams if the itial steepness and crest angle are known. (*Same item as* 2.2–178, Feb. 1951, *MAB.*) *Subject eadings:* **1. Ocean wave forecasting 2. Breakers 3. Nomograms.**—*I.L.D.*

5K–95 551.556:551.46:532.59

Johnson, J. W., **Relationships between wind and waves, Abbotts Lagoon, California.** *American eophysical Union, Transactions*, 31(3):386–392, June **1950.** 8 figs., 6 refs., 2 eqs. **MH-BH**—bservations were made on wind generated waves in order to determine the characteristics of waves id winds in relatively small bodies of water of limited fetch. The experimental procedure is escribed. The relationship between wave height and period, under conditions where the wave iaracteristics are controlled by fetch but not by wind duration, is represented as a function of tch and wind velocity by the following equations: $gH^2/U^2 = f'(gF/U^2)$ and $gT/U = f''(gF/U^2)$. ther information presented includes a relationship between wave steepness and wave age, wind adients and a typical frequency distribution of wave heights. (*Same item as* 11–112, Nov. 1950, *AB.*) *Subject Headings:* **1. Ocean wave characteristics 2. Wind-wave energy transfer 3. Ab-otts Lagoon, California.**—*I.L.D.*

5K–96 550.34

Longuet-Higgins, M. S., **Theory of origin of microseisms.** *Royal Society of London, Philosophical ransactions, Ser. A*, 243(857):1–35, Sept. **1950. DLC**—Results of study of wave motion which dicate that ocean waves may be cause of microseisms provided that there is interference between oups of waves of same frequency travelling opposite directions; suitable conditions of wave inter-rence may also occur at center of cyclonic depression or possibly if there is wave reflection from ast. *Subject Headings:* **1. Ocean wave interference 2. Microseisms from ocean waves.**

5K–97 532.593:551.465

†Mason, Martin A., **The transformation of waves in shallow water.** *Conference on Coastal ngineering, 1st, Oct.* **1950,** *Long Beach, California, Proceedings*, p. 22–31, pub. 1951. 10 figs., 16 eqs. bliog. **DWB**—A summary of existing knowledge of the processes involved in the movement of ogressive oscillatory waves through shallow water and the fundamental principles controlling these ocesses. Variability of wave characteristics and their physical significance are considered. Break-s and surf, the effect of currents on wave motion, reflection and surf beat are also discussed. *Sub-ct Headings:* **1. Shallow water wave theory 2. Ocean wave theory.**

5K–98 551.556:532.593

Mason, Martin A., **The wind element in beach erosion.** *U. S. Beach Erosion Board, Bulletin*, 3):19–23, July 1, **1950.** refs., 2 eqs. **DWB**—A brief discussion of wind as "the ultimate source

of the energy which, either directly as wind or indirectly through the medium of surface water wave causes transportation of sand along the shore and the bottom." *Subject Headings:* **1. Beach erosi 2. Wind effects 3. Wind-wave energy transfer.**

5K–99 551,556:551.46:532.59:627.5 (0

Minikin, Robert C. Royal, **Winds, waves and maritime structures. Studies in harbour maki and in the protection of coasts.** London, Charles Griffen, **1950.** 216 p. photos, diagrs., table charts. **DLC**—The text opens with a fairly technical chapter on wind and weather, followed b one on wave generation by wind, one on the theory of wave form, and then a number of chapters o the practical effects of waves on obstructions (breakwaters, foundations, sea walls, harbors, slipway dredging operations, etc.). A useful table gives the approximate period, length, height and rat of length to height, of waves generated by winds of Beaufort Force 6, 7, 8, 9, 10 and 11. The a proach is obviously for engineers and not meteorologists or oceanographers. (*Same item as* 4.3–18 March, 1953, *MAB.*) *Subject Headings:* **1. Ocean wave generation 2. Ocean wave height 3. Mi rine engineering 4. Textbooks.**—*M.R.*

5K–100 551.556:532.5

Munk, Walter H., **Origin and generation of waves.** *Conference on Coastal Engineering, Oct.* **1950,** *Long Beach, California, Proceedings,* p. 1–4. fig., 2 refs. Also in: *California. Universi Scripps Institution of Oceanography, Contribution, New Series,* No. 531, **1950. DWB**—The ent wave spectrum, embracing waves ranging in period from milliseconds to years is discussed and t present knowledge regarding the fundamentals of wave generation briefly reviewed. "By far t largest part of the spectrum reflects the action of the wind," and it is those waves at which resear forecast studies have been aimed. Waves of shorter and longer periods, however, exert an influen on shore installations. *Subject Headings:* **1. Ocean wave spectra 2. Ocean wave generati 3. Gravity waves.**

5K–101 551.556:532.5

*Neumann, Gerhard, **Über Seegang, Dünung und Wind.** [On state of the sea, swell, and win *Deutsche Hydrographische Zeitschrift,* 3 (1/2):40–57, **1950.** 10 figs., 4 tables, 14 refs., 15 eqs. **DWH** "The dimensions of fully roused wind waves for wind velocities up to 28 m/sec (11–12 Beaufort) a calculated" and compared with observations. Difference between "sea" and "swell" is explain and the complicated wave patterns and related measurement difficulties resulting from interferen of the two wave types are discussed. *Subject Headings:* **1. Ocean waves 2. Ocean swell 3. Oce wave data.**

5K–102 551.465 (

Rzheplinskiĭ, G. V., **O Suloiakh u iugo-vostochnogo poberezh'ia Kryma.** [On confluence alo the southeastern coast of Crimea.] *Meteorologiia i Gidrologiia,* No. 2:45–50, Oct. **1950.** 3 fi **DLC**—Description of the phenomenon called "suloi" which is the line of confluence of sea sw Observation of this phenomenon is an important factor in the investigation of the dynamics of swell and the hydrological regime of the sea. The observations made during 1948–1949 along southeastern coast of Crimea are described and some interesting characteristics of the therm conditions of sea water, and land-sea breezes in this area are given. *Subject Headings:* **1. Oce currents 2. Ocean swell 3. Oceanic confluence 4. Black Sea Coast, U.S.S.R. 5. Crim U.S.S.R.**—*N.T.Z.*

5K–103 551.556:551

Schaaf, S. A. and Sauer, F. M., **A note on the tangential transfer of energy between wind a waves.** *American Geophysical Union, Transactions,* 31 (6):867–869, Dec. **1950.** fig., 4 refs., 10 e **DWB**—A mathematical treatment of the transfer of energy between wind and waves by tangen friction forces is given, consistent to the second degree of approximation. The results, when co pared with the basic theory previously developed, show that the inclusion of second order te results in a more consistent theory. (*Same item as* 2.7–119, July 1951, *MAB.*) *Subject Headi* **1. Momentum transfer 2. Wind-wave energy transfer.**—*Authors' abstract.*

5K–104 551.506:551.

U. S. Hydrographic Office, **Sea and swell observations.** Its *Pub.* No. 606-e, **1950.** 8 p. tab figs., illus. **DN-HO**—Observers' manual containing brief descriptions of wave characteristics a types, observational techniques and Navy reporting procedure. *Subject Headings:* **1. Ocean w measurement 2. Manuals.**

5K–105 551.556:551.

van Straaten, L. M. J. U., **Periodic patterns of rippled and smooth areas on water surfa induced by wind action.** (*K.*) *Akademie van Wetenschappen te Amsterdam, Proceedings of the Sec*

of Sciences, 53(8):1217–1227, **1950.** 3 figs., 4 photos, 7 refs. **DLC**—Observations of two kinds of orderly rippling of shallow sea water were made by the author in the Wadden Sea of Holland during 1948 and 1949. One type consisted of a system of convective rolls parallel to the wind, with concentrations of seaweed, foam and oil in the descending portions (smooth water) and of wind waves in the ascending portions. In extremely shallow water, on vast level tide flats, another system was observed which the author claims has never before been described. This type consists of intermittent ripples and patches of smooth water at right angles to the wind. Similarity to convective cloud patterns is striking. Excellent photos are included. *Subject Headings:* **1. Ocean waves 2. Convective motion 3. Ripple patterns 4. Wadden Sea, Holland.**—*M.R.*

5K–106 551.46:532.59

Wiegel, Robert L., **Experimental study of surface waves in shoaling water.** *American Geophysical Union, Transactions*, 31(3):377–385, June **1950.** 10 figs., 18 refs., eq. **MH-BH**—A series of experiments were carried out in order to compare actual wave dimensions with those given by trochoidal theory for waves moving over a sloping beach. The shape of the elevation-time curves at a given point or "profiles" was generally found similar to that predicted by trochoidal theory as long as the waves were not in relatively shallow water ($D/L = 0.15$). In general RAYLEIGH's assumptions that a wave at any particular depth along a slope would have the same dimensions as in water of the same depth over a horizontal surface seemed to be valid except probably in the case of rapidly shoaling water (slopes steeper than 1–10 near the breaker zone). (*Same item as* 8–150, Aug. 1950, *MAB.*) *Subject Heading:* **1. Shallow water wave theory.**—*I.L.D.*

5K–107 551.556:532.593

†Wiegel, Robert L. and Johnson, J. W., **Elements of wave theory.** California. University Extension, Institute on Coastal Engineering, Long Beach, Calif., Oct. **1950.** 24 p. 17 figs., 27 refs., 41 eqs., 2 appends. Also in: *Conference on Coastal Engineering, 1st, Oct.* **1950,** *Long Beach, California, Proceedings*, p. 5–21. **MWB**—Discussion opens with a quick review of major developments in water wave research from GERSTNER (1802), through STOKES (1847), REYNOLDS (1877) and RAYLEIGH (1877). Author then goes on to trace the development of the theory and equations of 1) waves of small amplitude; 2) waves of finite amplitude (finite and infinite depth; trochoidal and irrotational theory; maximum theoretical wave steepness); 3) propagation of a finite wave train through an undisturbed media and 4) dimensionless representation of wave functions. Well illustrated. *Subject Headings:* **1. Ocean wave theory 2. Hydrodynamic theory.**

5K–108 551.556:551.46:532.593(794)

Wiegel, Robert L. and Kimberly, H. L., **Southern swell observed at Oceanside, California.** *American Geophysical Union, Transactions*, Pt. 1, 31(5):717–722, Oct. **1950.** 4 figs., table, 9 refs. **MH-BH**—Swell from S–SW on California coast, period 12–18 sec, up to heights of 8 ft was traced to area 40–65°S, 120–160°W. This is a place of maximum gale frequency in southern winter. (*Same item as* 2.8–98, Aug. 1951, *MAB.*) *Subject Headings:* **1. Ocean wave measurement 2. Ocean swell 3. Southern California 4. South Pacific.**—*C.E.P.B.*

5K–109 532.593:551.465

Yoshida, Kozo (*Tokyo*), **On the ocean wave spectrum with special reference to the beat phenomena and the "1–3 minute waves."** *Tokyo. University. Geophysical Institute, Geophysical Notes*, 3(39), **1950.** 8 p. 3 figs., 2 tables, 11 refs., 31 eqs., append. **MH-BH**—The possibilities of occurrence of beats and 1–3 minute waves are discussed from the standpoint of the structure of the wave spectrum. Concluded that 1–3 minute waves may occur when the energy in a continuous or discrete spectrum becomes concentrated in a comparatively narrow and finite interval of about 1–2 seconds in the neighborhood of the significant wave frequency. *Subject Headings:* **1. Surf beats 2. Ocean wave theory.**

5K–110 551.556:532.593

Yoshida, Kozo, **On the mechanism of the period increase of waves in storm areas.** *Tokyo. University. Geophysical Institute, Geophysical Notes*, 3(24), **1950.** 8 p. 3 figs., tables, 7 refs., 9 eqs. **MH-BH**—Paper is concerned with the mechanism of period increase of wind waves due to the energy transferred from wind in storm areas. The shift of the periods of the highest waves in the wave spectrum observed in this study is in agreement with empirical data of SVERDRUP and MUNK (see 1947 above). *Subject Headings:* **1. Period increase of waves 2. Ocean wave spectra 3. Wind-wave energy transfer.**—*From author's abstract.*

1951

5K–111 532.593:551.465

*Arthur, Robert S., **The effect of islands on surface waves.** *California. University. Scripps Institution of Oceanography, Bulletin*, 6(1):1–26, **1951.** 13 figs., plate, refs., 6 tables, 16 eqs. **Also**

in: *California. University. Scripps Institution of Oceanography, Contributions, New Series*, No. 50 **DWB**—Investigation made of the factors influencing wave conditions in the "wave shadow" in th "wave lee" of islands. Quantitative results indicate that the important factors determining th penetration of wave energy into the lee are refraction by underwater topography and variability i direction of wave travel. Results found adequate for explaining quantitatively the wave condition in the lee of the Island of Sicily, San Clemente Island and Santa Catalina Island. *Subject Hea ings:* **1. Ocean wave refraction 2. Ocean wave theory.**—*From author's abstract.*

5K–112 551.465:551.509.3

Bretschneider, C. L., **Revised wave forecasting relationships.** *Conference on Coastal Engineering 2nd* **1951,** *Houston, Texas, Proceedings*, p. 1–5. 4 figs., 2 refs. **DWB**—On the basis of more recen data than that used by SVERDRUP and MUNK (5K–40) new curves (fig. 1) are constructed showin the relationships between wind speed, wind duration, fetch, wave height and wave velocity. Othe figures contain forecasting curves for wave generation and decay and for travel time of swell. "I is found that the wave height and period at the end of the decay distance depend on the length o the fetch and the height and period at the end of the fetch as well as upon the decay distance. *Subject Headings:* **1. Ocean wave forecasting 2. Ocean wave decay 3. Ocean swell.**

5K–113 551.465:778

California. Univ. Scripps Institution of Oceanography, **Investigation of the physics an chemistry of the air-sea boundary layer.** California. Univ. Scripps Institution of Oceanography Contract AF 19(122)–413, Progress Report No. 1–2, June 1, 1951, Aug. 1, **1951.** 2 pieces, ref **DWB**—An attempt is made to devise a method for studying the roughness of the sea surface fro photographs of the sun's glitter on the water. A procedure for translating the statistics on th locations of highlights into the statistics of the distribution of slopes is developed. On the basis o the geometry of reflection and photogrammetry, a series of grids for each 5° of solar angle and f the orientations of the camera were constructed. The slope of a highlight is determined by placin the grids over aerial photographs of a glitter pattern. The grids are described and illustrated an a review of the literature on this problem including experimental work on ripple tanks is presente *Subject Headings:* **1. Ocean wave measurement 2. Aerial photography. I. Munk, Walter H II. Ewing, Gifford III. Contract AF 19(122)-413.**—*I.L.D.*

5K–114 550.34:551.46

Donn, William L. (*Lamont Geological Obs. Colum. Univ.*), **A comparison of microseisms an ocean waves recorded in Southern New England.** Columbia University, Lamont Geologic Observatory, Contract AF 19(122)441 and Contract N6onr 27133, Technical Report on Seismolog No. 21, March **1951.** 10+p. 7 fig., 8 refs., 2 tables. **DWB**—The recording of only weak micr seismic disturbance in cases of very high local waves unaccompanied by marine cyclonic activi lends added weight to the theory that "microseism storms are generated by pressure variations in t atmosphere." Portions of Woods Hole wave records and Weston, Mass., seismograms with char of related marine weather conditions are included. *Subject Headings:* **1. Microseisms from oce waves 2. Southern New England. I. Columbia University. Lamont Geological Observato II. Contract AF 19(122)441 III. Contract N6onr 27133.**—*M.P.K.*

5K–115 551.465(04)

Eckart, Carl, **Surface waves on water of variable depth; lecture notes, fall semester 195 1951, California University.** California. University. Scripps Institution of Oceanograph Contract N6ori-111, Task IV; Contract W-49-055-eng. 3, Project NR-083-005, Wave Report, N 100, Aug. **1951.** 99 p. 10 figs., refs., 136 eqs. **DWB**—The lectures are so arranged as to sta from the linearized equations of hydrodynamics and give "a logically consistent treatment of t propagation of waves in water of variable depth. The latter parts of Section 7 show in detail h the theory fails when the water depth becomes very small. The earlier lectures are directed towa the study of 'edge waves.' In the latter, a new wave equation is derived that appears able to accou for the dispersion and refraction that occur simultaneously in water of moderate depth. T equation is consistent with the 'energy theory' previously used to deal with this case, but appe to have systematic advantages over the earlier theory." [Quote from author's preface, p. v *Subject Headings:* **1. Ocean wave propagation 2. Ocean wave theory 3. Lecture series. I. Ca fornia. University. Scripps Institution of Oceanography II. Contract N6ori-111, Task III. Contract W-49-055-eng. 3.**

5K–116 551.5:551.46

Glenn, A. H., **Applications of meteorology and oceanography in marine industry on the G of Mexico.** *Texas Journal of Science*, 3(2):190–201, June 30, 1951. figs., photos, table. **DL** A summary of some ways in which a marine meteorologist can apply his knowledge of wind, wa

nd water level conditions associated with hurricanes, line squalls, northers and cyclones to planning nd forecasting for the offshore oil and fishing industries in the Gulf of Mexico. Bar graphs show erification of wave forecasts for the Grand Isle, La., area in May 1949 and November 1948. (See so article by same author in *Oil and Gas Journal*, 49(7):174–177, June 22, 1950.) (See also: ates, Charles C. and Glenn, Alfred H., **Oceanography in the offshore drill campaign.** *World Oil*, pril 1948; and Glenn, A. H., **Gulf Coast hurricane design data.** *World Oil*, Houston, Texas, . 101–104, Dec. 1950.) Both in **DLC.** *Subject Headings:* **1. Ocean wave forecasting 2. Offshore l industry 3. Fishing industry 4. Gulf of Mexico.**

5K–117 551.465:551.509.5

James, Richard W., **Test of wave forecasting methods applied to Long Branch, New Jersey.** lew York. Univ. College of Engineering. Dept. of Meteorology Contract W49-055eng.-1 [unumbered], Jan. **1951.** 37 p. 6 figs., 8 tables, 19 refs. **DN-HO**—Wave height and period were recast every four hours for six months. All methods used, including an analogue system similar o that used in weather forecasting, are described and their comparative accuracy discussed. Concluded that described methods, based mainly on the Sverdrup-Munk wave generation theory are ccurate for height forecasts and that further study is needed in order to forecast periods. *Subject leadings:* **1. Ocean wave forecasting 2. New Jersey coast. I. Contract W49-055-eng.-1 I. N. Y. Univ. College of Engineering, Dept. of Meteorology.**—*Author's abstract.*

5K–118 551.465(261/4)

Jessen, Otto, **Dünung im Atlantik und an der Westküste Afrikas.** [Swell in the Atlantic and n the west coast of Africa.] *Petermanns Geographische Mitteilungen*, 95(1):7–16, **1951.** 5 tables. **DLC**—After discussing origin of swell, the author describes direction and frequency at islands and long Atlantic coast of Africa, especially "rollers," swell on Maroccan coast and breakers at Swakopmund. Several problems require further investigation. *Subject Headings:* **1. Ocean swell 2. Atlantic Ocean 3. Morocco.**—*C.E.P.B.*

5K–119 551.515.2:532.593:550.342

Kammer, E. W., and Dinger, J. E., **Hurricane swell as a generator of microseisms.** *Journal f Meteorology*, 8(5):347–353, Oct. **1951.** 12 figs., table, 11 refs. **MH-BH**—From records of eismographs on Bahamas and east coast of the United States, it is concluded the microseisms ssociated with hurricanes do not originate on ocean floor below center. Longer periods are associated with higher wind speeds and are half of swell period independent of water depth. Amplitude increases rapidly as storm approaches shore, but decreases much more slowly as it moves way. Dominant source of microseisms is standing waves on ocean bottom near shore. (*Same item as* 3.5–156, May 1952, *MAB.*) *Subject Headings:* **1. Hurricane tracking 2. Microseisms from ocean waves.**—*C.E.P.B.*

5K–120 551.556:551.465 551.509.39(261)(262)

MacDougal, Frank, **Correlation of heights of observed and computed deep-water wind waves n North Atlantic Ocean and Mediterranean Sea.** *American Geophysical Union, Transactions*, 2(6):878–880, Dec. **1951.** fig., table, 3 refs., eqs. **MH-BH**—The Sverdrup-Munk method of recasting heights of wind waves by graphically relating wind speed and duration is tested on 650 epresentative observed values of deep water waves. Considering the numerous possible sources of rror, the coefficients of correlation, ranging from 81 to 91, were surprisingly high and indicated hat "hindcasting" of wave heights for statistical studies is valid. (*Same item as* 3.10–193, Oct., 952, *MAB.*) *Subject Headings:* **1. Ocean wave height 2. Ocean wave forecasting 3. Deep vater wave theory 4. North Atlantic Ocean 5. Mediterranean Sea.**

5K–121 532.593:551.465

Marks, Wilbur, **A survey of selected solutions to problems of refractions and diffraction of ght waves and sound waves and the analogies of these problems to water waves.** New York. Jniversity. College of Engineering. Dept. of Meteorology, Contract No. W49-055-eng.-1, Oct. **951.** 63 p. 30 figs., eqs., bibliog., p. 62–63. **DN-HO**—Several refraction and diffraction probems in light waves and sound waves have been selected, on the basis of practicability of experimentaon and upon the photographic technique employed, for study in the N.Y.U. ripple tank. Because he ripple tank propagates plane waves, one of the conditions imposed on the selection of the problem that the source be of such a nature that it propagates plane waves at a finite distance from the ystem. The analogies to these problems are demonstrated by testing plastic analogue models of he system under investigation in the ripple tank. If it is assumed that the initial and boundary onditions of the particular problem have been satisfied by the nature of the experiment, and it is ound that photographs of the systems undergoing experimentation clearly demonstrate the physical nterpretation of the mathematical solution, then we may conclude that the problem has an analogy

in water waves. The mathematical complexities of the problems vary from the trivial to treatmen involving several transformations. *Subject Headings:* **1. Water wave refraction 2. Water wa diffraction. I. U. S. Beach Erosion Board II. Contract W49-055-eng.-1.**—*From author's abstract*

5K–122 551.556:532.5

Miyazaki, Masamori, **On the relation among wind speed, tangential stress and roughne parameters of the sea surface.** *Oceanographical Magazine*, Tokyo, 3(1):17–21, March **1951.** tab refs., 15 eqs. **MH-BH**—Assuming an eddy-generating layer in the air-sea boundary, a formu valid for wind speeds above 6 to 7 m/sec and containing functions of the tangential stress and t wave elements, is derived. It is found that the wind stress is not only a function of the wi velocity but depends also on the state of the sea. *Subject Headings:* **1. Ocean wave generati 2. Tangential wind stress 3. Wind-wave energy transfer.**

5K–123 551.465:550.

Mukherjee, S. M., **Microseisms and sea waves.** *Seismological Society of America, Bulleti* 41(1):1–4, Jan. **1951.** fig., 7 refs. **DLC**—Graphic comparison of day to day variations of perio of monsoon microseisms at Bombay and Poona, India, with state of swell on the Arabian Sea a state of sea on its coast indicates remarkably high correlation. Forecast value mentioned. *Subj Headings:* **1. Microseisms from ocean waves 2. Poona, India 3. Bombay, India.**

5K–124 551.509:532.593:551.4

Munk, Walter Heinrich (*Univ. of Calif.*), **Ocean waves as a meteorological tool.** (In: **Co pendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 1090–1100. figs., 2 tables, 16 refs.) **MH-BH**—The various methods involving the propagation of ocean surfa waves as an aid in weather forecasting are described and their validity is examined. These meth are: 1) the height power method applied to visible swell; 2) the frequency spectrum method appl to forerunners of swell and 3) the storm surge method. The relative merits of these methods fr the point of view of instrumentation, success in storm location, range of effectiveness and estimati of storm intensities are examined and "some of the disadvantages and advantages of these meth are compared to methods involving the propagation of sound waves through the sea bottom (mic seisms) and electromagnetic waves through the atmosphere (radar and spherics)" are pointed o To render these methods more useful, additional studies on ocean wave forecasting for HT meth increase in network of stations for FA method and improved instrumentation for SS method, a required. (*Same item as* 4.7–4, July, 1953, *MAB.*) *Subject Headings:* **1. Ocean wave propagati 2. Weather forecasting 3. Ocean swell 4. Storm surges.**—*I.L.D.*

5K–125 551.509:551.4

†Munk, Walter Heinrich and Arthur, Robert S. (*Univ. of Calif.*), **Forecasting ocean waves.** (**Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 1082–10 4 figs., 2 tables, 25 refs.) **MH-BH**—The categories of sea, swell and surf are described and the deg of the dependence of their characteristics upon the meteorological situation is indicated. T theoretical-empirical method of forecasting significant waves, which is based upon the developm of equations which express the energy budget between wind and waves is presented. It is ba upon the hydrodynamical theories of irrotational waves of Airy for waves of small amplitude and Stokes for waves of finite amplitude. Certain constants occurring in the solution are evalua empirically. The empirically obtained graphs of SUTHONS for forecasting sea and swell are discuss The characteristics of the wave spectrum, its interpretation by means of harmonic analysis and attempts to forecast it are summarized. Problems in wave forecasting are the deviation of physi laws determining the growth of the component wave trains under wind action, forecasting transformation of swell travelling through the region of decay and predications of waves and sw from tropical storms. (*Same item as* 4.7–5, July, 1953, *MAB.*) *Subject Headings:* **1. Ocean wa forecasting 2. Ocean swell 3. Wind-wave energy transfer 4. Ocean wave spectra.**—*I.L.D.*

5K–126 551.556:441.465(7

O'Brien, Morrough P., **Wave measurements at the Columbia River light vessel, 1933–19** *American Geophysical Union, Transactions*, 32(6):875–877, Dec. **1951.** 3 tables, 2 refs. **MH-BH** Dimensions and periods of deep water waves, relation of wind speed to average ratio of leng height, and wave direction were observed 1933 to 1936 at the Columbia River Light Ship. Mea ments were adjusted to account for the effects of superposition on wave heights, lengths and perio On the basis of observed wave direction weighted according to wave heights associated with e direction it was found that the waves which would most likely account for beach erosion were stri the beach almost perpendicularly. From this it was concluded that erosion in the observed c was due to wind rather than waves. (*Same item as* 3.10–194, Oct. 1952, *MAB.*) *Subject Headin* **1. Ocean wave mechanics 2. Ocean wave measurement 3. Deep water waves 4. Beach eros 5. Columbia River Lightship.**

5K–127 551.509.39:551.465

*Pierson, Willard J., Jr., **The accuracy of present wave forecasting methods with reference to problems in beach erosion on the New Jersey and Long Island coasts.** *U. S. Beach Erosion Board, Technical Memorandum*, No. 24, April **1951.** 76 p. 27 figs., 11 tables, 19 refs. **DWB**—Using detailed April 11–May 31, 1948 weather data, an attempt was made to fit the observed to the forecast significant height and significant period. Various examples of techniques employed are described. An east coast storm and a tropical hurricane are studied. Statistical study of results shows forecasted significant periods are not accurate and are not distributed according to the distribution of the observed significant periods. Simple climatological forecast would have been more accurate. Attempt made to verify refraction diagram for Long Branch, N. J. Problems connected with beach erosion discussed qualitatively. Concluded that hindcasts are not accurate enough to be worth the effort involved and that any problem in wave action which depends critically on the wave period cannot be accurately handled by the present forecasting methods. (For further information and data basic to wave forecasting see *Idem.*, **The interpretation of crossed orthogonals in wave refraction phenomena.** *Ibid.*, No. 21, Jan. **1951.** 83 p.; Also his: **"Forecasting water waves on the East coast of the United States."** New York University. College of Engineering, Research Division, Contract W49-055-eng.-1, [Report?] **1949.** Also: Pierson, W. J., Jr.; Martineau, D. R.; James, R. W. and Picinki, L. S., **Ocean wave refraction data for the northern New Jersey coast,** *Ibid.*, Contract W49-055-eng.-1, [Report?] June **1951.**) *Subject Headings:* **1. Ocean wave forecasting 2. Beach erosion 3. East Coast, U. S. 4. Ocean wave refraction. I. Contract W49-055-eng.-1 II. N. Y. Univ. College of Engineering. Dept. of Meteorology.**—*From author's abstract.*

5K–128 551.556:532.593

Roll, Hans Ulrich, **Neue Messungen zur Entstehung von Wasserwellen durch Wind.** [New measurements of the formation water waves by wind.] *Annalen der Meteorologie*, 4(1–6):269–286, **1951.** 9 figs., 12 photos, 2 tables, 25 refs. German and English summaries p. 269–270. **MH-BH**—A study of initiation and downwind development of waves in shore pools at low tide. The results agree with theoretical calculations. Above a wind speed of 5 m/s at 35 cm, wave structure changes greatly, probably due to change from laminar to turbulent flow in the boundary layer. *Subject Headings:* **1. Ocean wave generation 2. Critical wind velocity.**—*C.E.P.B.*

5K–129 551.556:551.465:551.509.39

U. S. Hydrographic Office, **Techniques for forecasting wind waves and swell.** Washington, D. C., **1951.** 37 p. figs., 10 plates (2 fold.), tables, refs. Its *H. O. Pub.* No. 604. **DWB**—Manual dealing with the generation of waves and with the travel of waves in deep water after they have left the regions of strong winds. Methods are described for determining the characteristics of wind waves by means of data from adequate, consecutive synoptic weather maps and for forecasting swell off coasts. Energy transfer from wind to waves and the relationships between waves and the three variables, wind velocity, duration and fetch are discussed. (*Same item as* 3.9–164, Sept. 1952, *MAB.*) *Subject Headings:* **1. Ocean wave forecasting 2. Ocean swell forecasting 3. Wind-wave energy transfer.**

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5K–130 551.5:532.59:550.342

Bossolasco, Mario, **Seegang, meteorologische Faktoren und Mikroseismik.** [Waves, meteorological factors and microseisms.] *Annalen der Meteorologie*, 5(7–12):298–302, **1952.** 4 figs., 2 refs. German and English summaries p. 298. **MH-BH**—Continuous records of wave amplitude and periodicity near Genoa are analyzed. Diurnal variation shows peak amplitude 13–18 h (wind speed Jan.–May peak 13 h). Change of wave height is negatively related to 3-hr pressure tendency, negative isallobaric centers within 300 km increasing wave height, positive centers decreasing it. Rapid increase or decrease of wave activity causes similar changes of microseisms at Genoa showing that the latter are due in part to breakers on the shore. *Subject Headings:* **1. Ocean wave data 2. Microseisms from ocean waves 3. Genoa.**—*C.E.P.B.*

5K–131 551.556:551.465

Bernasconi, Carlo; Bossolasco, Mario and Dagnino, Ignazio, **Nuovo metodo di registrazione dello state del mare e primi risultati a Genova.** [New method of recording the state of the sea and first results obtained in Genoa.] *Geofisica Pura e Applicata*, 21:159–168, **1952.** 3 figs., 6 refs., 13 eqs. Italian, English and German summaries p. 159. **MH-BH**—The new method described consists of transforming the vertical movement of the sea surface into compression or expansion of a column of air by means of a sensitive membrane. Analysis of early results obtained during the first several months of use at Genoa, indicate the importance of cold front passage to state of the sea. (*Same item as* 4.2–169, Feb. 1953, *MAB.*) *Subject Headings:* **1. Ocean wave measurement 2. Oceanographic instruments 3. Genoa, Italy.**

5K–132 551.556:532.593:551.46

†Bretschneider, C. L., **The generation and decay of wind waves in deep water.** *American Geophysical Union, Transactions*, 33(3):381–389, June **1952.** 5 figs., 25 refs. **MH-BH**—Data on the generation and decay of wind-generated gravity waves have been collected for several years by the University of California. These data, as well as the original data of SVERDRUP and MUNK are analyzed and the results presented in dimensionless graphs suitable for use in wave forecasting. The dimensionless parameters presented by SVERDRUP and MUNK are suitable; however, new curves were constructed which include new data recently available. In order that the data on the decay of waves could be presented in a logical manner, a concept, based upon the following observations was introduced: (1) Individual waves do not maintain their identity in deep water, (2) a spectrum of lengths and heights is present in both the fetch and decay areas, (3) at any particular decay distance the significant period decreases with time, (4) the significant period increases with decay distance in a manner different from that assumed by SVERDRUP and MUNK for their decay relationships, (5) travel time depends upon the group velocity associated with the significant period at the end of the decay distance. It was found that the significant wave heights and period at the end of the decay distance depend upon the length of the fetch and the height and period at the end of the fetch as well as upon the decay distance. (*Same item as* 4.2–170, Feb. 1953, *MAB.*) *Subject Headings:* **1. Wind-wave energy transfer 2. Ocean wave decay 3. Deep water wave theory.**—*Author's abstract.*

5K–133 550.34:01

†Gutenberg, Beno and Andrews, F. (*ed.*), **Bibliography of microseisms.** 2nd ed. rev. & enl. California Institute of Technology, Contract AF 19(122)436, Scientific Report, No. 1, Sept. **1952.** 94 p. 468 refs. *California Institute of Technology. Div. of Earth Sciences, Contribution, No. 604.* **DWB**—Contains 468 references, some with long abstracts, and many unannotated. Items are listed alphabetically by author. Sources of material are (1) authors abstracts and (2) abstracts by B. GUTENBERG of papers available in the Seismological laboratory at Pasadena, (3) titles of papers collected by DR. H. E. LANDSBERG, (4) bibliography on Seismology published at Ottawa, Canada, vol. 10, 12, 13 and 14 and (5) geophysical abstracts published periodically by U. S. Bureau of Mines. Many items refer to microseismic activity resulting from storms. *Subject Headings:* **1. Microseism bibliographies. I. Contract AF 19(122)436 II. California Institute of Technology III. Landsberg, H. E.**—*M.R.*

5K–134 551.501:551.556:551.46

Cox, Charles and Munk, Walter H., **The measurement of the roughness of the sea surface from photographs of the sun's glitter, Pt. I, The method. Pt. II, The results. Pt. III, The interpretation.** California. Univ. Scripps Institution of Oceanography, Contract AF 19(122)-413, AF Technical Report, No. 2, 3 and 4, Nov. 24, **1952**; Aug. 28, **1953** and Jan. 14, **1954.** Pt. I, 29 p. 14 plates, figs. 6 refs., eqs.; Pt. II, 21 p. 12 tables, eqs., 3 refs.; Pt. III, 24 p. figs., refs., eqs. **DWB**—A method developed for interpreting the statistics of the sun's glitter on the sea surface in terms of the statistics of the slope distribution. The method consists of two principal phases: 1. Of identifying, from geometric considerations, any point on the surface with the particular slope required for the reflection of the sun's rays toward the observer; and 2. Of interpreting the average brightness of the sea surface in the vicinity of this point in terms of the frequency with which this particular slope occurs. The method has been applied to aerial photographs taken under carefully chosen conditions in the Hawaiian area. Pt. II covers the results of this investigation. The frequency distribution of slopes is expressed by Gram-Charlier series in two dimensions. The root-mean-square slopes (up, down and crosswind), the skewness and the peakedness are given for various wind speeds, and for water surface with and without a slicks. Pt. III comprises an interpretation of the results given in Pt. II in terms of models having simple wave spectra. The observed nearly Gaussian distribution of slopes is inconsistent with a spectrum consisting of a few discrete frequencies but can be accounted for by a continuous spectrum of arbitrary width. *Subject Headings:* **1. Ocean wave measurement 2. Aerial photography. I. California. University. Scripps Institution of Oceanography II. Contract AF 19(122)-413.**—*From authors' abstract.*

5K–135 551.556:551.4

Darbyshire, J., **The generation of waves by wind.** *Royal Society of London, Proceedings*, 215(1122):299–328, Dec. 5, **1952.** 16 figs., 13 refs., 20 eqs. **DWB**—Spectra of wave trains off British coasts and Lough Neagh with fetch of 1–1,000 miles were analyzed harmonically and compared with winds from isobaric charts. A number of relations between maximum wave height H_T (feet), wave period T (sec) and wind U (knots) are deduced, especially $H_T/T = 0.44 e^{\{-(T/U-\epsilon)^2/0.0027\}}$ where $\epsilon = 0.24$ for fetch above 100 miles but decreases with decreasing fetch below 100 miles. Various expressions are given for wave steepness; in equilibrium (after 200–300 miles) steepness of highest waves is proportional to $1/\sqrt{U}$. The use of the results for prediction

aves and swell is illustrated and the theory of wave travel discussed. (*Same item as* 4.6–147, une 1953, *MAB.*) *Subject Headings:* **1. Ocean wave propagation 2. Ocean wave generation . Ocean wave forecasting.**—*C.E.P.B.*

5K–136 551.465

D'Arrigo, Agatino, **Ifluenza meteomorfolitologica inerente alla caratterizzazione del moto ndoso in mare, in correlazione alla piattaforma litorale, al fetch ed alla disintegrazione dell'energia otenziale dell'onda d'oscillazione in energia cinetica del frangente.** [Meteomorphological influence herent in the characteristics of wave motion on the sea in relation to bottom configuration, fetch nd transformation of the potential energy of oscillating waves into the kinetic energy of surf.] *eofisica Pura e Applicata*, 21:86–96, **1952.** refs. English summary p. 86. **MH-BH**—Article iefly concerned with effect of waves on marine structures. Correlations between wave character- tics and wind fetch and configuration of the continental shelf are considered. *Subject Headings:* **. Surf 2. Ocean waves 3. Mediterranean Sea.**

5K–137 551.509.59:551.46:532.59

Great Britain. Naval Weather Service, **Observing, forecasting and reporting ocean waves nd surf.** Its *Memo*, 147/52, July **1952.** 13 p. 8 figs., 11 diagrs., 3 tables. Mimeog. **GB-MO** -1) Observations of wave characteristics—direction, period and height. 2) Waves in the generating rea—estimating period and height from synoptic and prebaratic charts. 3) The decay of swell ith distance from generating area. 4) The effect of currents and tidal streams. 5) Wave char- cteristics in shallow water. 6) Breaker characteristics—straight beach with fathom lines parallel the beach. 7) Reporting wave observations and forecasts. Calculation diagrams are given ith examples of their use. (*Same item as* 4.5–77, May 1953, *MAB.*) *Subject Headings:* **1. Ocean ave forecasting 2. Breakers 3. Shallow water wave theory.**—*C.E.P.B.*

5K–138 532.593:624

*Johnson, J. W., **Engineering aspects of diffraction and refraction.** *American Society of Civil ngineers, Proceedings*, Vol. 78, *Separate* No. 122, March **1952.** 32 p. 18 figs., 8 tables, 30 eqs., fs. **DLC**—Water wave diffraction and refraction and their relation to the design, construction, nd operation of many coastal engineering works are discussed. The method of forecasting waves mentioned. In an appendix, basic wave diffraction theory and computational techniques are ummarized. *Subject Headings:* **1. Ocean wave theory 2. Ocean wave diffraction 3. Ocean wave efraction.**

5K–139 551.556:532.593

Johnson, Joe William and Rice, E. K. (*Univ. of California*), **A laboratory investigation of wind- enerated waves.** *American Geophysical Union, Transactions*, 33(6):845–854, Dec. **1952.** 7 figs., tables, 16 refs. **MH-BH**—Waves were generated by forcing wind through a covered laboratory ume. For steady-state conditions, measurements by means of an oscillograph were made of the ave characteristics at various points in the flume. The significant heights and periods were deter- ined and related to the fetch and wind speed. The height and period of the individual waves for arious fetch lengths were compared by means of joint frequency diagrams. The orbital motions of articles throughout the water depth were determined from motion pictures. Particle velocities elow the crest are compared with theoretical relationships. Some information on wind set-up nd shear-stress coefficients is presented. (*Same item as* 4.11–189, Nov. 1953, *MAB.*) *Subject eading:* **1. Ocean wave laboratory models.**—*Authors' abstract.*

5K–140 551.5(26):550.34:532.593

Kammer, Erwin and Dinger, J. E. (*U. S. Naval Res. Lab.*), **The aerologist puts an ear to the round.** *U. S. Office of Naval Research, Research Reviews*, March **1952,** p. 26–30. 4 figs. **DWB**— nvestigations of coastal microseisms as to their correlations with water wave activity are reported. t is pointed out that information obtained from microseisms could usefully supplement inadequate eather data received from vast ocean areas. A few microseismic storms observed in Sept. and ct. 1951 are described and data on microseisms measured at Atlantic coast stations presented and ompared with corresponding wave activity. (*Same item as* 5.3–16, March 1952, *MAB.*) *Subject eadings:* **1. Microseisms from ocean waves 2. Marine meteorology 3. Atlantic Coast.**—*G.T.*

5K–141 551.556:532.593:551.465

Krylov, IU. M., **O mekhanizme rosta vetrovykh voln.** [The mechanism of the growth of ind waves.] *Meteorologiia i Gidrologiia*, No. 5:49–51, **1952.** 2 figs., 6 refs. **DLC**—The author nalyzed mathematically the distribution of wind energy near the water surface for various phases of ave evolution. An unstable air flow near the water surface decays into separate vortexes forming nall waves. A further increase of wind velocity causes circumfluent flow of air upon the sea

waves. Two types of pressure originate: normal pressure perpendicular to the wave profile an pressure directed tangentially to the profile. They are the sources of posterior wave modificatio and growth. (*Same item as* 4.9–142, Sept. 1953, *MAB.*) *Subject Headings:* **1. Wind-wave energ transfer 2. Ocean wave mechanics.**—*N.T.Z.*

5K–142 551.556:551.46

Longuet-Higgins, M. S. (*Trinity College, Cambridge*), **On the statistical distribution of the height of sea waves.** *Journal of Marine Research*, 11(3):245–266, **1952.** 9 figs., 2 tables, refs., 73 eq **DWB**—The statistical distribution of wave-heights is derived theoretically on the assumptio (a) that the wave spectrum contains a single narrow band of frequencies and (b) that the wav energy is being received from a large number of different sources whose phases are random. The retical relations are found between the root-mean-square wave-height, the mean height of t highest one-third (or highest one-tenth) waves and the most probable height of the largest wave i a given interval of time. There is close agreement with observation. (*Same item as* 4.9–14 Sept. 1953, *MAB.*) *Subject Heading:* **1. Ocean wave height.**—*Author's abstract.*

5K–143 532.59

Mason, Martin A. (*U. S. Beach Erosion Bd.*), **Surface water wave theories.** *American Soci of Civil Engineers, Proceedings*, Vol. 78, *Separate* No. 120, March **1952.** 29 p. 15 figs., 12 eq 68 refs. **DLC**—Characteristics of oscillatory waves are briefly summarized and the developme of the theory of progressive oscillatory wave motion reviewed. A discussion of the SVERDRU MUNK (see 5K–40) and JEFFREYS theories of oscillatory wave generation is well illustrated wit diagrams showing the agreement between theoretical and experimental results. Wave refractio diffraction, and reflection are also briefly treated. *Subject Heading:* **1. Ocean wave theory.**

5K–144 551.556:532.593.551.4

Neumann, Gerhard, **On the complex nature of ocean waves and the growth of the sea und the action of wind.** *U. S. National Bureau of Standards, Circular, No.* 521:61–68, **1952.** 4 fig table, 3 refs., 3 eqs. **DWB**—Observed wave dimensions are compared with values derived fro theory. Growth of "sea" in relation to the complex nature of the ocean waves for given wind v locities is dealt with. Analysis starts from the energy equation in a form which equates the tim variation of the wave energy to the difference between the energy supplied and the dissipatio Dissipation coefficients, or coefficients of eddy viscosity of the complex wave with its turbulen depends on wind intensity and conditions of the sea. Differential relations between wave velocit length and height and the fetch and wind duration are developed for a given wind intensity. Sat factory agreement between theory and observations obtained. *Subject Headings:* **1. Wind-wa energy transfer 2. Ocean wave generation.**—*From author's abstract.*

5K–145 551.556:532.593:551.4

Pierson, Willard J., Jr., **On the propagation of waves from a model fetch at sea.** *Nation Bureau of Standards, Circular, No.* 521:175–186, **1952.** 4 figs., table, 9 refs., 28 eqs. **DLC, DBS** Previously known solutions; simple sine wave, the Couchy-Poisson problem, and the Gaussian Wa Packet, to gravity wave propagation in infinitely deep water are shown to be inadequate in practic wave forecasting problems. The new exact solutions are presented, one for a finite wave group a the other for a finite wave train. Problem of waves propagating into calm air and still water fro the edge of an area of generation is considered. Forerunners of swell, transformation of sea in swell and period increase of swell discussed. Concluded that sound wave forecasting theory mu be based upon the properties of the spectrum of the waves at the source region. Quantitati information needed. *Subject Headings:* **1. Ocean wave forecasting 2. Ocean wave theory 3. Oce swell.**—*From author's abstract.*

5K–146 551.556:532.593:551.4

*Pierson, Willard J., Jr., **A unified mathematical theory for the analysis, propagation, and r fraction of storm generated ocean surface waves, Part I.** New York University, College of E gineering, Dept. of Meteorology, Research Division, March 1, **1952.** Contract W49-055-erg. Contract Nonr-285(23). 336 p. 30 figs., 16 tables, 56 plates, bibliog. p. 332–336, eqs. **DWB** This monumental work comprises the first part of a book by the same title, the rest of which w appear in bi-monthly installments. A resume of classical wave theory is followed by chapt dealing with periodic and non-periodic wave group functions, wave propagation, model wave syster wave forecasting and methods for determination of wave spectra. An appendix includes "six ve interesting figures which illustrate the great range of possible wave records" and subsequent int pretations. *Subject Headings:* **1. Ocean wave propagation 2. Ocean wave forecasting 3. Oce wave theory 4. Ocean wave spectra. I. New York Univ. College of Engineering. Dept. Meteorology II. Contract W49-055-eng.-1 III. Contract Nonr-285(03).**

5K–147 532.59:551.465

*Pierson, Willard J. and Marks, Wilbur, **The power spectrum analysis of ocean-wave records.** *merican Geophysical Union, Transactions,* 33(6):834–844, Dec. **1952.** 6 figs., 3 tables, refs., eqs. **DWB**—Techniques of power spectrum analysis developed by Tukey and Hamming for e analysis of noise in electronic circuits are applied to the power spectrum of a sea-surface record mputed directly from the power spectrum of a pressure record. Statistical properties of the wave cords are deduced and verified within the limits of a linearized theory. The implications of the sults with respect to the problem of wave forecasting and wave refraction are discussed. Relation- ip between the non-normalized autocorrelation function and the power spectrum is given and the sults of DEACON and SEIWELL interpreted in connection with the results of the analysis. *Subject eadings:* **1. Ocean wave spectra analysis 2. Ocean wave forecasting.**—*Authors' abstract.*

5K–148 551.556:551.465(26)

*Polli, Silvio (*Instituto Talassografico, Trieste*), **Moto ondoso e vento nel Golfo di Trieste.** [Wave otion and wind in the Gulf of Trieste.] *Geofisica Pura e Applicata,* 21:102–109, **1952.** fig., tables, refs. Italian and English summaries p. 102. **MH-BH**—Monthly and annual mean values wave motion are derived from 1931–1950 data. Correlation coefficients found between wind elocity and wave motion varied from −0.49 to 0.94. (*Same item as* 4.1–152, Jan. 1953, *MAB.*) *ubject Headings:* **1. Ocean wave data 2. Gulf of Trieste.**

5K–149 551.465:519.24

*Putz, R. R., **Statistical distributions for ocean waves.** *American Geophysical Union, Trans- tions,* 33(5):685–692, Oct. **1952.** 11 figs., 6 refs., 2 tables, 6 eqs. (See also: *Idem.*, **Idealized constructions of ocean surface waves as inferred from measurements on twenty-five subsurface essure records.** California. University. Dept. of Engineering. Contract N7onr-295.28, eport No. HE-116-317, Sept. 12, **1950.**) **DLC**—Results presented from analysis of underwater essure recorder data from the Pacific Ocean. Computed parameters describing the statistical stribution of wave heights and wave periods are given and incorporated into one parameter prob- ility model closely fitting the data. The model for wave-height distribution is found to provide a tisfactory explanation for the ratios among the mean and certain specified wave heights reported other observers. The degree of relation between the heights of periods of successive waves or tween the height and period of the same wave was found to be relatively low. *Subject Headings:* **Underwater wave recorder 2. Ocean wave heights 3. Ocean wave periods 4. Statistical alysis of ocean waves. I. Contract N7onr-295.28 II. California. University. Dept. of En- neering.**—*Author's abstract.*

5K–150 551.556:551.465

Roll, Hans Ulrich (*Met. Amt für NW-Deutschland, Hamburg*), **Gibt es eine "kritische Wind- schwindigkeit" für Prozesse an der Grenzflache Wasser-Luft?** [Is there a "critical wind ve- city" for air-sea boundary processes?] *Geofisica Pura e Applicata,* 21:110–126, **1952.** 11 figs., refs. German and English summaries p. 110. **MH-BH**—Although it seems there is no absolute ritical wind velocity," observations indicate that there are relative values dependent on fetch. he following observed marks support the theory of relative values: change from smooth to rough a, change from laminar to turbulent boundary—layer flow, breaking of gravity waves and decrease the resistance coefficient of the sea surface to a minimum. (*Same item as* 4.1–153, Jan. 1953, *AB.*) *Subject Headings:* **1. Ocean wave generation 2. Wind-wave energy transfer 3. Critical nd velocity.**

5K–151 621.396.932:551.465

Roll, Hans Ulrich, **Messung der Meereswellen mit Radar (Vorläufige Mitteilung).** [Measure- ent of sea waves by radar (Preliminary communication).] *Annalen der Meteorologie,* 5(7/12): 3–404, **1952.** fig. **MH-BH**—Using 3 cm radar in North Sea, antenna rotating in 2.65 sec, otos were taken at 7.95 sec intervals. Example shown. The direction and distance apart of e swell crests are clearly shown, even swell too low to be seen by eye. *Subject Headings:* **1. Radar hoes from sea 2. Ocean wave measurement 3. North Sea.**—*C.E.P.B.*

5K–152 551.5:551.465

*Roll, Hans Ulrich, **Statistik von Wellenbeobachtungen Nordatlantischer Wetterschiffe, Nov. 50–Okt. 1951, und Deutscher Feuerschiffe, 1949/50.** [Wave observation statistics by North lantic weather ships, Nov. 1950–Oct. 1951, and by German light ships, 1949/50.] Hamburg, t. **1952.** 25 p. maps, tables. Mimeo. **DWB**—Charts show distribution of wave heights and riods seasonally, for the year and by wave direction quadrants. The observations which were ade mostly by eye and do not attempt to distinguish between waves and swells are the first at- mpt to collect new wave statistics for scientific and all practical purposes. *Subject Headings:*

1. Ocean wave height data 2. Ocean wave period data 3. North Atlantic Ocean 4. Weather ship I. Germany. Meteorologisches Amt für Nordwestdeutschland.

5K–153 551.556:551.515.8:551.4

Roll, Hans-Ulrich, **Über Grossenunterschiede der Meereswellen bei Warm und Kaltluft.** [O the size-difference of sea waves in warm and cold air.] *Deutsche Hydrographische Zeitschrift*, 5 (2/3 111-114, **1952.** 2 figs., 5 refs. German, English and French summaries p. 111. **DWB**—Observ tions on N. Atlantic weather ships show that with winds of equal force waves are higher and steeper cold than in warm air. (*Same item as* 4.4–173, April 1953, *MAB.*) *Subject Headings:* **1. Oce wave height 2. Wind-wave energy transfer 3. Air masses.**—*C.E.P.B.*

5K–154 551.556:551.4

Roll, Hans-Ulrich, **Wie rasch entwickelt sich die Sturmsee?** [How quickly does a storm s develop?] *Wetterlotse*, Hamburg, 35:1–6, Jan. **1952.** fig. **DWB**—On 24–25 Aug. 1951, wa height at JIG increased from 5–12 m in 3 hours, in cold air behind a trough, and finally to 14 Author concludes that wave development is greater in cold than warm air of the same wind for (*Same time as* 3.8–134, Aug. 1952, *MAB.*) *Subject Headings:* **1. Ocean wave height 2. Ocean wa generation.**—*C.E.P.B.*

5K–155 551.501.18:551.556:551.465 (449.4

Rouch, J. and Broc, J. (*Musée Océanographique de Monaco*), **Utilisation du radar du Mus Océanographique de Monaco pour des mesures de météorologie nautique.** [Use of radar at t Oceanographic Museum of Monaco for marine meteorological measurements.] *Geofisica Pur Applicata*, 21:39–40, **1952.** English summary p. 39. **MH-BH**—Since 1949 radar has been u extensively at the Musée Océanographique in Monaco to study clouds, atmospheric vapor, verti motion and turbulence. Radar echoes from the sea surface taken in conjunction with other obser tions facilitate the study of the relationship between wind and state of the sea. (*Same item* 3.11–34, Nov. 1952, *MAB.*) *Subject Headings:* **1. Radar echoes from sea 2. Radar meteorol 3. Ocean wave measurement 4. Monaco.**

5K–156 551.556:532.593 551.46:532.59:525.6 (

Russell, R. C. H. and Macmillan, D. H., **Waves and tides.** London, Hutchinson, **1952.** 34 figs., plates, tables, refs. **GB-MO**—Pt. I deals with waves—their characteristics, ideal wav generation, reflection, etc. and their action in moving materials and on structures, with a section wave measuring. Chap. 3 (p. 50–71, 4 figs., 10 refs.) describes generation of waves by wind, ef of fetch, wave heights in open sea (quoting various formulas) in relation to wind force and durati decay of waves, wave trains and theories of wave production. Pt. II deals with tides, includ "Tides and the weather" (p. 266–273, 2 figs., table) including storm surges and abnormal ti due to wind and pressure. (*Same item as* 4.10–178, Oct. 1953, *MAB.*) *Subject Headings:* **1. St tides 2. Ocean wave theory 3. Ocean wave generation.**—*C.E.P.B.*

5K–157 551.556:532.593:551.

*Saville, Thorndike, Jr., **Wind set-up and waves in shallow water.** *U. S. Beach Erosion Bo Technical Memorandum*, No. 27, June **1952.** 36 p. 18 figs., 6 tables, 12 refs., eqs. **DWB**—L Okeechobee (Florida) wind, wave and water level data recorded during two hurricanes are analy to "relate wind set-up and observed wave heights to wind velocity, fetch, water depth and sur shape of the lake." *Subject Headings:* **1. Wind wave data 2. Water level fluctuations 3. L Okeechobee, Florida.**

5K–158 551.556:532.593:551

Tenani, Mario, **Nozioni teoriche fondamentali sulla formazione e trasformazione delle o Nuovi metodi grafici di calcolo e di previsione.** [Fundamental theoretical notions on the forma and transformation of waves. A new graphic method of measuring and predicting.] *Italy. tuto Idrografico, Genoa, I.I.*3125, **1952.** 126 p. 33 figs. (some fold.), tables, refs., eqs. **DW** One of the most comprehensive studies on sea surface waves. The theoretical part discusses pe length, propagation and attenuation of waves for deep water, energy transport and modifica and the influence of wind, and gives intuitive considerations of the development of waves and t energy balance. Numerous nomograms facilitate the practical application of the theory. experimental verification of the theory is discussed and a series of empirical relationships comm used, analyzed. Considerable effort is devoted to the prediction problem of the state of the dependent on meteorological conditions (surface wind calculations from isobar maps, effect of speed and duration, etc.). Synoptic situations leading to swells, discussed. Chap. IV deals waves in shallow water; Chap. V with the breaking of waves. Verification of the theoretical

ations by means of photographs, discussed. (*Same item as* 4.7–10, July 1953, *MAB.*) *Subject adings:* **1. Ocean wave forecasting 2. Ocean wave generation 3. Ocean swell 4. Nomograms.** *A.A.*

5K–159 551.556:551.465:532.593

Tenani, Mario, **Relazioni tra la velocita del vento e le caratteristiche del mote ondoso al largo in costa.** [Relation between wind velocity and wave motion characteristics at sea and off the ast.] *Geofisica Pura e Applicata*, 21:131–132, 1952. ref. English summary p. 131. **MH-BH**—ie author points out that the confirmation of the theory of NEUMANN's significant waves, which ffer from those of SVERDRUP and MUNK, would require observations of an accuracy not yet avail-le. The existence of these waves would not change SVERDRUP and MUNK's conclusions outside e wind area. *Subject Heading:* **1. Ocean wave theory.**—*From English summary.*

5K–160 551.556:532.593:551.465

*Thijsse, J. Th. (*Waterloopkundig Lab., Delft*), **Growth of wind-generated waves and energy ansfer.** *U. S. National Bureau of Standards, Circular*, No. 521:281–287, 1952. 2 figs., 2 tables, efs., eqs. **DBS**—Observations in the wind flume of the hydraulics laboratory at Delft, Holland, d on Dutch lakes show fair agreement with the graph of SVERDRUP and MUNK (5K–40) for growth waves by wind. Graph extended to account for limited depth of water. Combined observations the same wind flume and on a water current flowing over a fixed (paraffin) model of a wind-nerated wave indicate normal pressure as the dominant factor in the transfer of energy to waves. lculation of SVERDRUP and MUNK's "sheltering coefficient" explained and NIKURADSE's "roughness ngth" determined. *Subject Headings:* **1. Ocean wave generation 2. Wind-wave energy transfer.** *om author's abstract.*

5K–161 551.511:531.75

*†U. S. National Bureau of Standards, **Gravity waves. Proceedings of the NBS Semicentennial mposium on Gravity Waves held at the NBS on June 18–20, 1951.** Its *Circular*, 521, Nov. 28, 52. 287 p. figs., tables, refs., eqs. **DBS**—The 33 papers in this volume cover some of the results, th experimental and theoretical, of the study of gravity waves from many leading institutions th in the United States and abroad. Of special interest in the field of ocean waves are the follow-g: IVERSEN, H. W., **Laboratory study of breakers,** p. 9–32; SCHUMACHER, A., **Results of exact wave easurements (by stereophotogrammetry) with special reference to more recent theoretical in-stigations,** p. 69–78; MUNK, W. H. and ARTHUR, R. S., **Wave intensity along a refracted ray,** 95–108; LACOMBE, H., **The diffraction of a swell. A practical solution and its justification,** p. 129–0; ECKART, CARL, **The propagation of gravity waves from deep to shallow water,** p. 165–173; EACON, G. E. R., **Analysis of sea waves,** p. 209–214; MASON, M. A., **Some observations of breaking aves,** p. 215–220 and BIESEL, F., **Study of wave propagation in water of gradually varying depth,** 243–253. *Subject Headings:* **1. Breakers 2. Ocean wave measurement 3. Ocean wave prop-gation 4. Ocean wave refraction.**

5K–162 551.556:532.59:551.465

Titov, L. F., **Novye shkaly stepeni volneniia i sostoianiia moria.** [New scales for sea swell and ate of sea.] *Meteorologiia i Gidrologiia*, No. 5:23–28, 1952. 3 tables. **DLC**—After critical marks on the present scales of sea swell, the author presents three scales for more accurate de-rmination of swell processes. The values of minimal depth of sea are given in tables, for each adation of the scale, because the intensity of swell processes depends on the sea depth. (*Same m as* 4.10–179, Oct. 1953, *MAB.*) *Subject Headings:* **1. Ocean swell 2. Ocean waves.**—*N.T.Z.*

5K–163 551.515.13:551.556:551.465(266)

Todd, D. K. and Wiegel, R. L., **Near-coastal storms and associated waves.** *American Geo-ysical Union, Transactions*, 33(2):217–225, April 1952. 5 figs., 6 tables, refs. **MH-BH**—Because the erosive action on beaches of high, short-period waves generated by near-coastal storms, the eteorological situations associated with these storms are investigated. The situations for the acific Coast of the United States are classified, based on a study of three years of daily weather aps. The monthly and latitudinal distributions of near-coastal storms are tabulated. Wave recasting problems and limitations are discussed. Data from two near-coastal storms at Oceanside, alifornia, are presented to illustrate the wind and wave conditions, forecasting problems and beach ffects. *Subject Headings:* **1. Coastal storms 2. Ocean wave forecasting 3. Beach erosion Pacific Coast, U. S.**—*Authors' abstract.*

5K–164 551.46.018

Tucker, M. J., **A wave-recorder for use in ships.** *Nature*, London, 170(4329):657–659, Oct. , 1952. 2 figs. **DLC**—Various methods of measuring wave height at sea are summarized. A

new method in use by the British National Institute of Oceanography is described. It consists a measurement by pressure gage of height of water surface above points low on each side of shi hull, and by accelerometer of height of this point above a reference plane. Specimen records a analysis given. *Subject Headings:* **1. Ocean wave height 2. Ocean wave measurement.**—*C.E.P*

1953

5K–165 551.556:532.593:551.

*Arakawa, H. and Suda, K. (*Met. Res. Inst. & Hydrographic Dept., Tokyo*), **Analysis of wir wind waves and swell over the sea to the east of Japan during the typhoon of Sept. 26, 1935.** *Mon Weather Review*, 81(2):31–37, Feb. **1953.** 6 figs., 8 tables, 8 refs. **MH-BH**—Occurrence of storm and its movement across a main squadron of the Imperial Japanese Fleet which was t conducting grand maneuvers provided what may be the best coverage on record of surface wi wind waves, and swell within 200 nautical miles of a typhoon center in its mature stage, and furnis an unequaled set of data for studying the relation between the meteorological and oceanograph elements over the ocean during a period of hurricane winds. (*Same item as* 4.11–188, Nov. 1 *MAB.*) *Subject Headings:* **1. Ocean waves 2. Ocean swell 3. Typhoons 4. Northwest Pacifi** *Authors' abstract.*

5K–166 551.556:532

Brown, P. R., **Wave data for the eastern North Atlantic.** *Marine Observer*, 23(160):94 April **1953.** 5 figs., 3 refs. **DWB**—Graphs show relation of mean wave height to wind spee knots at Weather Ships I and J, and effect of temperature difference, sea minus air, on wave he (the larger the difference the greater the height), and relation between wave period in seconds wind speed (increase from 6 sec below 10 kn to 10 sec at 60 kn). Results are briefly discus (*Same item as* 4.10–176, Oct. 1953, *MAB.*) *Subject Headings:* **1. Ocean wave height 2. Eas North Atlantic.**—*C.E.P.B.*

5K–167 550.345:

†Cuellar, Marcial P., **Annotated bibliography on tsunamis.** *U. S. Beach Erosion Board, T nical Memorandum*, No. 30, Feb. **1953.** 69 p. 195 refs. **DWB**—References, 1836–1948, listed chronologically and followed by author and geographical indexes. *Subject Headings:* **1. namis bibliographies 2. Bibliographies. I. American Geophysical Union. Committee for Study of Tsunamis.**

5K–168 551.465:551.5

Dearduff, Robert F., **A comparison of observed and hindcast wave characteristics off south New England.** *U. S. Beach Erosion Board, Bulletin*, 7(4):4–9, Oct. **1, 1953.** 4 figs., refs. **DW** Data used were 116 wave observations made 40 mi southeast of Nantucket (180 ft of water) 58 7-min records from a pressure-type recorder installed in 30 ft of water off Martha's Viney Comparison of recorded with hindcast height and period showed good similarity of phase patt however, the average difference between hindcast height and recorded period as being 2.4 sec greater than the hindcast. It is felt that refraction caused the generally smaller wave height the waves recorded off the Vineyard than those which were hindcast. *Subject Headings:* **1. O wave hindcasting 2. New England coast.**

5K–169 551.556:532.593:62

Hebeker, Otto, **Seegang.** [State of the sea.] *Wetterlotse*, 56:97–105, April **1953.** 2 ta 2 refs., 3 eqs. **DWB**—Discussion of wind waves and the strains they impose on a ship. Fac included are relations between wave period, length and velocity, and wind force, and effect ships of different length and displacement. (*Same item as* 5.4–158, April 1953, *MAB.*) *Su Headings:* **1. Ocean waves 2. Ship building.**—*C.E.P.B.*

5K–170 551.509.3(26):55

Kajiwara, S. and Ureshino, Y., **Forecasting of waves in the East China Sea.** *Journal of teorological Research*, Tokyo, 4(12):945–950, March **1953.** 7 figs., tables, 7 refs. In Japa English summary p. 59. **MH-BH**—From relations between geostrophic (x) and actual wind m/s in E. China Sea ($y=0.9x-0.7$) and W. Honshu Sea ($y=0.8x-1.5$) and growth of wave he and period in terms of wind velocity and fetch (after SVERDRUP) a satisfactory method of foreca wave height and period is found. *Subject Headings:* **1. Ocean wave forecasting 2. China Se** *C.E.P.B.*

5K–171 551.465:532.593:551.5

*Kaplan, Kenneth, **Analysis of moving fetches for wave forecasting.** *U. S. Beach Er Board, Technical Memorandum*, No. 35, March **1953.** 39 p. 22 figs., 9 refs., 6 plates, tables.

)—Report is an attempt at standardizing and simplifying wave forecasting procedures so as to ke possible accurate wave forecasts by those with only a cursory knowledge of meteorological l wind wave theories. Eight separate forecast situations are described, forecast procedures out- ed and a typical forecast made. Plates include charts and diagrams on which the forecasts are ed. *Subject Heading:* **1. Ocean wave forecasting.**

5K–172 551.556:532.593:551.465

Neumann, Gerhard, **On ocean wave spectra and a new method of forecasting wind-generated** . *U. S. Beach Erosion Board, Technical Memorandum*, No. 43, Dec. **1953.** 42 p. 12 figs., ables, refs. **DWB**—NEUMANN's method is presented for deriving the wave spectrum, for specific ids, for any point within a wave generating area, from which other parameters such as the average, nificant or maximum waves can be evaluated. The empirical part of the investigation is based visual wave observations and on selected records of waves off Long Branch, N. J. Results fer somewhat from the SVERDRUP-MUNK (see 5K–40) technique now in general use. *Subject adings:* **1. Ocean wave forecasting 2. Ocean wave spectra.**

5K–173 551.556:532.593:551.465

New York Univ. Dept. of Meteorology and Oceanography, **Pilot study of ocean waves.** ntract N189s-86743, Final Report, Oct. 8, **1953.** 10 p. refs. **DWB**—The studies and research ich led to the preparation of the wave forecasting manual by PIERSON, W. J.; NEUMANN, GERHARD l JAMES, R. W. (see 5K–174) are described. The theoretical work which was done to complete the ory by NEUMANN and PIERSON is summarized and the references where this work will be published given. It is shown that other theoretical work, initiated but not completed, was done in order provide additional avenues of attack on the basic theoretical problems which had to be solved ore the manual could be written. The plans for completion of this work are described. Other oblems which were suggested by the research which was conducted are reviewed. They suggest olications and extensions of the principles of the manual to forecasting problems and operational oblems not covered in the current work. *Subject Headings:* **1. Ocean wave forecasting 2. Ocean ve theory.**—*Author's abstract.*

5K–174 551.556:551.465:551.509.39

Pierson, Willard J., Jr.; Neumann, Gerhard and James, Richard W., **Practical methods for serving and forecasting ocean waves by means of wave spectra and statistics. New York. iv. College of Engineering, Research Div., Contract N189s-86743, Technical Report, No. 1, 953). 322 p. figs., tables, photos, bibliog. p. 320–322. Numerous loose leaf diagrs. and tables separate envelope. **DWB**—This report is a compendium of the latest facts and theories about an waves stemming from years of research in Britain and in the U. S. chiefly at N.Y. Univ. ler contract with the Beach Erosion Board and the Office of Naval Research. Subjects treated lude the properties of ocean waves, the generation and forecasting of sea waves, wave propagation l forcasting swell waves, wave observation techniques, synoptic forcasting methods and weather p analysis, wave refraction, operational applications of forecasting methods, and sample wave ecasts. Special attention paid to the spectrum of wind generated ocean waves, co-cumulative ctra for various wind speeds as functions of duration and fetch and the refraction of wave spectra. port is well illustrated with charts, graphs, figures, aerial photos, tables and numerous references 320) which lead the reader to detailed coverages of the theory touched upon. *Subject Headings:* **Ocean wave theory 2. Ocean wave forecasting 3. Ocean wave spectra 4. Ocean wave re- ction. I. New York Univ. College of Engineering. Research Div. II. Contract N189s-86743 U. S. Bureau of Aeronautics (Navy) IV. Project AROWA.**

5K–175 551.465:519.24

Putz, R. R. (*University of California*), **Statistical analysis of wave records.** *Conference on astal Engineering, Fourth, Chicago, Illinois*, 1953, *Proceedings*, p. 13–24, 7 figs., 13 refs. **DWB**— tablishment of quantitative relationships between recorded wave-system characteristics and er phenomena requires numerical description of the wave record. Current concepts applied to e histories of wave activity at a point are discussed. Characteristic statistical regularities nd in wave measurements are described. Examples given show the application of statistical hniques to the description of wave systems in terms of the distribution of spectral energy as l as the distributions of "individual" wave heights and periods. Results from the prediction, m one point to another, of surface time histories illustrate the application of approximate spectral ormation. *Subject Heading:* **1. Statistical analysis of ocean waves.**—*Author's abstract.*

5K–176 551.556:532.593

Révillon, Vaisseau, **Houle, état de la mer, courants dus au vent.** [Swell, state of the sea, and d currents.] *La Météorologie*, Paris, 4th Ser., 30:103–135, April/June 1953. 29 figs. French,

English and Italian summaries p. 103. **MH-BH**—An extensive treatment of the major aspects scientific forecasting of waves and currents at sea and along coasts. The terms in use are f defined and the theory of waves developed. Then the actual complexity of the waves created wind at sea, as compared with theory is discussed. Principles of forecasting waves and state of s and practical methods, aids, etc. are described and illustrated. The British Admiralty Tables a the Bates nomograms for predicting wave height from wind speed and fetch (40, 100, 200, 300, and 750 mi) for 6, 12, 18, 24 and 36 hours duration of wind and distance of travel of 0–2000 mi giving wave heights of 2′ to 30′ are presented and discussed in connection with rapid predicti methods. (*Same item as* 5.8–175, Aug. 1954, *MAB.*) *Subject Headings:* **1. Ocean wave forecasti 2. Ocean currents.**—*M.R.*

5K–177 621.396.932:551.4

Roll, Hans Ulrik, **Seegangsmessung durch Radar.** [Measurement of the state of the sea us radar.] *Der Seewart*, 14(5):9–12, Oct. **1953.** 2 figs. **DWB**—It is concluded that radar techniq which show wave length and direction are of definite value in wave research. Two photogra of the radar scope of the fishing boat "Meerkatze" are included with accompanying wind direct and force, and values for wave direction, length, period (measured) and height (estimated). C case shows swell and other wind waves. Methods for measuring wave height needed. *Sub Headings:* **1. Ocean wave measurement 2. Radar echoes from sea.**

5K–178 551.465:551.481.1:551.5

*Saville, Thorndike, Jr., **Wave and lake level statistics for Lake Michigan.** *U. S. Beach Eros Board, Technical Memorandum*, No. 36, March **1953.** 23 p. Idem . . . **Lake Erie.** *Ibid.*, No. **1953.** 14 p.; Idem . . . **Lake Ontario.** *Ibid.*, No. 38, **1953.** 15 p.; figs., tables, appends., re (See also: *Ibid.*, **Hindcast wave statistics for the Great Lakes.** *Conference, Coastal Engineeri Fourth, Chicago, Illinois*, **1953,** *Proceedings*, p. 1–12, 5 figs., 2 tables, 12 refs. **DWB.)** **DWI** Extensive monthly tabulated statistical wave height and period hindcast data for the Great Lak Figures show monthly mean water levels of the various lakes, 1860 to 1953, locations of wave reco ing stations, average seasonal fluctuations of water level, etc. *Subject Headings:* **1. Wave height d 2. Wave period data 3. Great Lakes 4. Water level fluctuations.**

5K–179 551.465:551.311

Shapiro, A. and Simpson, L. S. (*Div. of Oceanogr., U. S. Navy Hydrogr. Off., Wash., D.* **The effect of a broken icefield on water waves.** *American Geophysical Union, Transactions*, 34 36–42, Feb. **1953.** 4 figs., 4 refs., 18 eqs. **MH-BH**—Study made in order to facilitate the fo casting of sea and swell in broken icefields. A selective damping in exponential may occur if wa waves enter an icefield. Practical formulas are developed on the basis of recent theoretical stu by PETERS, WEITZ and KELLER. Nomograms presented for amplitude of waves approachi reflected and transmitted at the border of the icefield, dependent on thickness of ice, as well as percentage of transmitted wave energy introducing a new factor: the "pressure energy." *Sub Headings:* **1. Ocean wave forecasting 2. Ice fields.**—*A.A.*

5K–180 551.556:551.

Shuleĭkin, V. V., **Kak energiia vetra peredaetsia volne.** [How wind energy is transmitted waves.] *Akademiia Nauk SSSR, Doklady*, 91(5):1079–1082, Aug. **11, 1953.** 2 refs., 13 e (See also: *Ibid.*, 92(1):41–44, Sept. **1953.**) **DLC**—The accepted hypothesis attributes the tran of wind energy to waves to unequal pressure on the sides of the wave and the resultant force act upon the wave velocity expresses the force transferred to the wave. The classical expression fo wave profile in which the limiting conditions are based upon the assumption that atmosph pressure on the water surface is constant is shown to be erroneous. An expression is derived giv the wind energy (W_v) transmitted to a wave per unit area of water surface. $W_v = \frac{n}{2} \cdot \frac{h}{T} \delta_a (V -$ where n =coefficient dependent upon the steepness of the wave h/λ; V =wind velocity, c =w velocity and δ_a =atmospheric density. The amount of energy utilized in producing a wave internal friction η is determined by the formula $\eta = \frac{(2+r/R)(1-\cos\alpha)}{1+(1+r/R)(1-\cos\alpha)}$; where R—cente gravity; r—center of oscillation and α the angle of declination from the vertical. *Subject Headi* **1. Wind-wave energy transfer 2. Ocean wave generation 3. Ocean wave theory.**—*I.L.D.*

5K–181 551.556:532.593:551.

Shuleĭkin, V. V., **Profil' i osnovnye parametry vetrovoĭ volny.** [Profile and the basic parame of wind waves.] *Akademiia Nauk SSSR, Doklady*, Moscow, 93(2):265–268, Nov. **11, 1953.** 3 fi 11 refs. **DLC**—The photographing and filming of waves made in an artificial storm basin permit

e author, not only to study in detail the wave's profile, but even to disclose definite regularities its transformation. In this theoretical paper are derived the common equations of the curve set which belong, not only the profiles of the investigated waves, but also of trochoids (as a particular se) which are peculiar to the profile of surge waves. *Subject Headings:* **1. Ocean wave theory Ocean wave laboratory experiments.**—*A.M.P.*

5K–182 551.532.593:551.465

U. S. Beach Erosion Board, **The mechanics of deep water, shallow water, and breaking waves.** s *Technical Memorandum*, No. 40, March **1953.** 24 p. 25 figs., tables, 4 refs., 11 eqs. **DWB**— xperimental data are presented for deep water, shallow water, and breaking waves with respect the wave surface history, the horizontal and vertical particle velocities and the particle orbits. ne measurements are compared where applicable to Stokes' wave theory. Stokes wave theory d other wave theories show good agreement with the measurements for deep water conditions and en to d/L values of approximately 0.2. Theories do not apply to shallow water conditions nere d/L values are appreciably less than 0.2 and the waves have an appreciable steepness. *Subject eadings:* **1. Deep water wave theory 2. Shallow water wave theory 3. Breakers.**—*Author's stract.*

5K–183 551.465:551.509.5

U. S. Beach Erosion Board, **Comparison of deep water wave forecasts by the Darbyshire and retschneider methods and recorded waves for Point Arguello, California, 26–29, October 1950.** s *Bulletin*, 7(4):1–3, Oct. 1, **1953.** 2 figs., 5 refs. **DWB**—Graphic comparison of significant ave height and period forecasts by the Darbyshire and Bretschneider methods with recorded nditions for Point Arguello indicate that the major disparity in both cases is one of time. The retschneider method more closely forecast the maximum wave height but the Darbyshire method llowed the observed curve more closely. Both methods gave values of the same order of magnitude nd, statistically, would seem to give roughly the same frequencies. *Subject Headings:* **1. Ocean ave forecasting 2. Point Arguello, Calif. I. Datz, Mortimer.**

5K–184 551.556:551.465

U. S. Bureau of Aeronautics (Navy), **Sea, surf and swell forecasting.** Project AROWA (TED-NL-MA-501.5), First Quarterly Progress Report, May 18–Dec. 10, 1952, pub. Jan. **1953.** 26 p. tables. **DWB**—Outline of the proposed manual on ocean waves, report on progress in investigation various instrumental (subsurface, shipborne, air-borne) methods for obtaining ocean wave records; scussion of data collection and analysis to date; comments on theoretical paper on response of ips to waves; and remarks on visual observation methods: Project staff listed and objectives entioned. *Subject Headings:* **1. Ocean wave forecasting 2. Oceanographic research 3. Ocean vell. I. Project AROWA (TED-UNL-MA-501.5) II. New York University. College of Engineer-g. Dept. of Meteorology and Oceanography III. Contract N189s-86743 IV. Pierson, W. J., Jr. James, R. VI. Marks, W. VII. Neumann, G.**

5K–185 551.465

Watters, Jessie K. A., **Distribution of height in ocean waves.** *New Zealand Journal of Science d Technology, Section B*, 34(5):408–422, March **1953.** 7 figs., 2 tables, 6 refs., eqs., append. *New aland. Oceanographic Committee, Pub.* No. 11. **DN-HO**—Study of wave heights from selected min (at 2 hr intervals) wave records at Greymouth. Histograms show percentage frequency of currence of wave heights. For every record, mean wave height, and means of the highest one-third d one-tenth waves were extracted, examined and relationships established. These results were mpared with theoretical relationships. Theory assuming that the water level was distributed out the mean according to the normal error law proved satisfactory. *Subject Headings:* **1. Ocean ave height 2. New Zealand.**—*Author's abstract.*

5K–186 551.465:03

†Wiegel, Robert L., **Waves, tides, currents and beaches: glossary of terms and list of standard mbols.** Pub. by Council on Wave Research, The Engineering Foundation, July, **1953.** 113 p. figs., 27 refs. Price: $1.00. **DWB**—An authoritative collection of standardized definitions of e many terms peculiar to the field of physical oceanography. Photographs and sketches illustrate me difficult concepts. A list of standard symbols with their definitions and customary units is cluded on pages 101–109. *Subject Headings:* **1. Physical oceanography 2. Glossaries.**

1954

5K–187 551.5:551.465

Francis, J. R. D., **Laboratory models of sea surface phenomena.** *Weather*, 9(6):163–168, ne **1954.** 2 figs., 3 photos, 9 refs. **MH-BH**—"Wind wave" tunnels are described and results of

investigations summarized. Frictional drag is attributed to small ripples riding on long wave Wave height increases with increasing temperature difference water—air. Other investigations a mentioned. *Subject Heading:* **1. Ocean wave laboratory models.**—*C.E.P.B.*

5K–188 551.501:551.46

Holmes, John F., **Deep water wave pole.** Woods Hole Oceanographic Institution, Contrac NObsr-43270, Technical Report, [unnumbered] Feb. **1954.** Unpubl. manuscript. 3 p. diagr **DN-HO**—Description of a new type of wave pole (for deep water wave measurement) which ha known oscillating characteristics that can be separated from the wave measurements relative t the pole. (For information of wave measurement techniques, see also, Holmes, J. F. and Bartel V. O., **Evaluation of British sea and swell recorder.** Woods Hole Oceanographic Institution, Co tract NObsr-43270, Ref. No. 53–79, Oct. **1953.**) *Subject Headings:* **1. Ocean wave measuremen I. Woods Hole Oceanographic Institution II. Contract NObsr-43270.**

5K–189 551.556:551.465:551.509.3

James, Richard W. (*Dept. of Meteorology & Oceanography, New York Univ.*), **An example a wave forecast based on energy spectrum method.** *American Geophysical Union, Transaction* 35(1):153–160, Feb. **1954.** 6 figs., 4 tables, 7 refs. **MH-BH**—A method is presented for wa forecasting based upon the energy spectrum of the wave system. Detailed descriptions of t forecasting graphs are given and the forecasting procedure explained. A numerical exampl involving generation and decay of waves in an East Coast storm, is discussed. *Subject Heading* **1. Ocean wave forecasting 2. Ocean wave spectra.**—*Author's abstract.*

5K–190 551.465:551.509

Kaplan, Kenneth and Saville, Thorndike, Jr., **Comparison of hindcast and observed wav along the northern New Jersey coast for the storm of November 6–7, 1953.** *U. S. Beach Erosio Board, Bulletin,* 8(3):13–17, July 1, **1954.** 2 figs., 5 refs., table. **DWB**—Four hindcast summari of wave data (for the severe Nov. 1953 storm) derived by the Sverdrup-Munk-Bretschneider a proach and one using the Pierson-Neumann method are shown graphically on fig. 2. Table includes summaries of both the forecasting parameters derived from the six-hourly U. S. Weath Bureau North American Surface charts and the hindcast wave parameters, obtained first by u of the Bretschneider forecasting and decay curves, then by the Pierson-Neumann technique. Hin cast values of 27 to 35 ft for wave height maxima compared reasonably well with observed values 30 to 40 ft. *Subject Headings:* **1. Ocean wave forecasting 2. New Jersey coast, U. S.**

5K–191 551.556:532.593:551.4

*Miche, M., **Movements ondulatoires de la mer en profondeur constant ou décroissante.** *A nales des Ponts et Chaussées,* Paris, 115:1945. **DLC.** Translation available as, **Undulatory mov ments of the sea in constant or decreasing depth.** *California. University. College of Engineerin Institute of Engineering Research, Wave Research Laboratory, Series* 3, Issue 363, June **1954.** 96 23 figs., 11 tables, 210 eqs. **DN-HO**—An extensive study in which the 1) general form of perio and cylindrical undulatory movements, with emphasis on swell and standing waves in unlimit depth, are determined uniformly to the second order of approximation; 2) formulas are establish for the standing wave and swell giving, to the first order of approximation, cylindrical undulato movements of an unlimited mass for water of regularly decreasing depth; and 3) the limiting for near the crest, of all swell, rotational or not, is investigated at the point of breaking. The princi characteristics of breaking waves in constant depth, expressed as a function of their relative leng are calculated and shown to verify the good numerical accord between the values obtained a those acquired from a great number of observations. Finally, the laws and circumstances of t increase of velocity on the approach of the waves to shore is studied. *Subject Headings:* **1. Oce wave generation 2. Ocean wave theory 3. Ocean swell decay 4. Shallow water wave theo I. Lincoln, M.** (*trans.*) **II. Chevron, R. R.** (*trans.*) **III. Fusha, R. A.** (*ed.*).—*Author's introducti*

5K–192 551.4

Walden, Robert G. and Whitney, G. G., Jr., **An anchored wave telemetering buoy.** Woo Hole Oceanographic Institution, Reference, No. 54-37, Contract NObsr-43270 [Unnumbere May **1954.** Unpubl. manuscript. 8 p. 7 figs. **DN-HO**—Description of an electronic wa telemetering buoy (in use over a year at Woods Hole) which provides recordings of waves fr one in. to 6 or 7 ft in water 12–70 ft deep. For description of the step-resistance ocean wave ga *see U. S. Beach Erosion Board, Technical Memorandum,* No. 6, Oct. 1948, **An ocean wave measur instrument;** and *Ibid.*, No. 18, July 1950, **The Rayleigh disk as a wave direction indicator.** *Sub Headings:* **1. Ocean wave measurement. I. Woods Hole Oceanographic Institution II. Contr NObsr-43270.**

SUPPLEMENTARY MATERIAL

5K–193 551.465 [02]

†Thorade, Hermann, **Probleme der Wasserwellen.** [Problems of water waves.] *Probleme der osmischen Physik*, Hamburg, No. 13–14, **1931.** 219 p. 5 photos, 4 maps, 110 illus., bibliog. 195–211. **MWB**—Comprehensive review of theoretical studies of all types of ocean waves cluding a long list of literature covering the period from 1687 to 1930. *Subject Headings:* **1. Ocean aves 2. Textbooks.**

5K–194 551.582.3:551.465

*U. S. Hydrographic Office, **Atlas of sea and swell charts. North Atlantic Ocean,** *U. S. Hydro-aphic Office, Miscellaneous Publication*, No. 10,712A, **1943. South Atlantic Ocean,** *Ibid.*, No. 99B, **1948. Northwestern and Southwestern Pacific Ocean,** *Ibid.*, No. 799C-E, **1948. North-istern Pacific Ocean,** *Ibid.*, No. 799D, **1948. Indian Ocean,** *Ibid.*, No. 799G, **1948.** all charts. **N-HO**—Monthly charts show both graphically and with figures, by means of an eight point ouble rose, the character of the seas and swells that have prevailed within each small subdivision the various oceans. *Subject Headings:* **1. Ocean wave data 2. Ocean swell data 3. Atlantic cean 4. Pacific Ocean 5. Indian Ocean.**

5K–195 509.39:551.465

*California. University at L.A. Department of Engineering, **Summary of surf observations nd forecasts for selected storms in the North Pacific August 1944–August 1945.** Contract NObs 490, Technical Report HE-166-203, April 3, **1946.** 61 p. tables, appends. (*See also:* HERMANSON, . T. and STUMP, R. S., **Comparison of forecast and observed waves from two Pacific storms.** *Ibid.*, Contract NObs 16290, Technical Report HE-116-124, July 26, **1945.**) **DN-HO**—Tabulated sults of an investigation of the methods of forecasting surf conditions on the California Coast. urf forecasts for 50 cases of individual storms showed good height and period agreement with bservations. Forecast time of arrival consistently late. *Subject Headings:* **1. Ocean wave fore-isting 2. Surf 3. Ocean wave height data 4. Ocean wave period data 5. California Coast. Contract NObs 2490 II. Contract NObs 16290.**

5K–196 551.465

†Johnson, J. W., **Research on waves, surf, and related problems.** California. University at .A. Dept. of Engineering, Contract NObs 2490, Technical Report HE-116-274, June **1948.** p. photos, chart, diagrs., graphs, bibliog. **DWB**—A brief, pictorial description of the nature the problems on waves that have been investigated at the University of California for the U. S. avy. Among the types of problems considered susceptible to analysis are wave forecasting, wave haracteristics in shallow water, laboratory studies, behavior of landing craft in surf and wave easuring instruments. Good bibliography on each separate problem is included. *Subject Head-gs:* **1. Ocean wave research. I. California Univ. at L.A. Dept. of Engineering II. Contract Obs 2490.**

5K–197 551.465:519.24

*Burt, W. V.; Anderson, E. R.; Saur, J. F. T., Jr.; Horrer, P. L. and Thompson, W., **A statistical udy of wave conditions at four sheltered areas.** *California. University. Scripps Institution of ceanography, Wave Report*, No. 69, Oct. **1947.** 26 p. 9 figs., 13 tables, 12 refs., 5 plates. (*See also:* alifornia. University. Scripps Institution of Oceanography, **A statistical study of wave conditions five open sea localities along the California Coast.** Its *Wave Report*, No. 68, **1947**; and *Idem.*, **statistical study of wave conditions at four open sea localities in the North Pacific.** Its *Wave eport*, No. 53 (unpubl.), **1946. DN-HO**—Contains wave height and wave length data for almost nd-locked and for relatively sheltered bodies of water. For open sea data refer to *Wave Reports*, o. 53 and No. 68. *Subject Headings:* **1. Ocean wave height data 2. Ocean wave length data Pacific Ocean.**

5K–198 551.465

Neumann, Gerhard, **Über die komplexe Natur des Seeganges. I. Teil. Neue Seegangs-eobachtungen im Nordatlantischen Ozean, in der Karibischen See und im Golf von Mexico (M.S. Heidelberg," Oktober 1950–Februar 1951).** [On the complexity of the state of the sea. Pt. 1. ew observations of the state of the sea in the North Atlantic, Caribbean Sea and Gulf of Mexico.] *id.*, **II. Teil. Das Anwachsen der Wellen unter dem Einfluss des Windes.** [Pt. 2. The growth waves under the influence of wind.] Pt. 1, *Deutsche Hydrographische Zeitschrift*, 5(2–3):95–110, **52.** Pt. 2, *Ibid.*, 5(5–6):252–277, **1952.** numerous figs., tables, refs., eqs. German, English and ench summaries. **DWB**—In Pt. 1 it is shown that there are generally 3 major wave groups

(forming a band dependent on the wind force) the interference of which causes the observed variatio of wave length and height. Detailed observations shown in a folding table. From interaction wind and growing waves, and dissipation of wave energy by turbulence (Pt. 2), relations of wa dimensions to wind velocity, fetch and duration are calculated and expressed in a series of diagram These can be used to forecast wave periods and spectrum and mean and maximum wave height (*Same items as* 4.4–172 and 4.9–144, April and Sept. 1953, *MAB.*) *Subject Headings:* **1. Ocean wa spectra 2. Ocean wave forecasting 3. Wind-wave energy transfer 4. North Atlantic 5. Cari bean Sea 6. Gulf of Mexico.**—*C.E.P.B.*

5K–199 551.4

*†Pierson, Willard J., Jr., **A unified mathematical theory for the analysis, propagation, and fraction of storm generated ocean surface waves. Part I. Preliminary distribution.** New Yo University. College of Engineering. Dept. of Meteorology, Contract W49-055-eng-1, and Contra Nonr-285(03), [Report] March 1, 1952. 336 p. 56 plates, 16 tables, 25 figs., bibliog. p. 332–3 eqs. (Abstract in American Geophysical Union, Program of 33rd Annual Meeting, May 19 Wash., D. C., p. 326.) **DWB**—Comprises the first ten chapters of the book by the same tit Adequate methods of analysis of a short crested sea surface are given which depend upon a pow spectrum in two variables, namely, wave frequency ($2\pi/T$) and wave direction (θ). A Lebesg power integral for the Gaussian case is then shown to represent all of the known properties of a sh crested sea surface (except those due to non-linearity). The representation of the sea surface th derived is applied to the problem of wave forecasting. The transformation of sea into swell, decrease of wave height with travel, and the period increase of ocean swell are all demonstrated the theory. *Subject Headings:* **1. Ocean wave spectra 2. Power spectrum analysis 3. Ocean wa forecasting. I. New York University. College of Engineering. Dept. of Meteorology II. C tract W49-055-eng-1 III. Contract Nonr-285(03).**—*From author's abstract.*

5K–200 551.4

Deacon, G. E. R., **The growth and decay of waves.** Abstract in *National Institute of Oce ography, Collected Reprints*, Vol. 1, No. 3, 1953. **DWB**—Attempts to study generation and propa tion of waves must take full account of the composite character of the wave pattern and of different capacities of the component wave trains for absorbing, retaining and transferring ener Progress in study of wave propagation summarized. Problems of wave generation more diffic Wave spectra, relation of wave velocity to wind velocity, wind duration, dependence of wave grow on wave length, and critical wind velocities are among factors which must be considered. *Sub Headings:* **1. Ocean wave propagation 2. Ocean wave generation 3. Ocean wave spectra.**—*Fr author's abstract.*

5K–201 551.556:551.

Eckart, Carl, **The generation of wind waves on a water surface.** *Journal of Applied Phys* 24(12):1485–1494, Dec. 1953. 3 figs., refs., 60 eqs. **DWB**—Author "develops a theory for generation of forced, non-sinusoidal, but infinitesimal and irrotational surface waves." Assu that the wind pressure is normal to the disturbed surface of the water and has a variable compon resulting from gusts which move with the mean wind speed. Calculations are made for an idealiz long continuing storm as well as for the effect of a single gust. Possible reasons for the inadequ of the theory in accounting quantitatively for the wave height are discussed. The relation of theory to Jeffreys' sheltering theory is also discussed and it is shown that both postulate that variable component of the wind stress is normal to the water surface. The sheltering theory postulates that the wind pressure lags 90° behind the surface disturbance. A similar phase lag consequence of the assumptions of the present theory. (For a statistical treatment of wind st on the sea surface, see *Idem.*, **Relation between time averages and ensemble averages in the tistical dynamics of continuous media.** *Physical Review*, 91(4):784–790, Aug. 1953.) *Sub Headings:* **1. Ocean wave generation 2. Ocean wave theory 3. Wind stress 4. Sheltering the** —*From author's abstract.*

5K–202 551.

*Groves, Gordon W., **A statistical description of average wave conditions near the entranc San Diego Bay.** *California. University, Scripps Institution of Oceanography, Wave Report*, No. Dec. 10, 1953. 17 p. 3 figs., tables, refs., appends. **DN-HO**—Making use of wave refract diagrams and wave conditions offshore, average and seasonal ocean wave conditions at two locati near the entrance to San Diego Bay are described in terms of the frequencies in percentage of ti that the height, period and direction of the "significant" waves lie within various ranges of va Variation of amplitudes of bottom pressure signal and bottom orbital velocities and displacem discussed. *Subject Headings:* **1. Ocean wave height data 2. Ocean wave period data 3. San Di Bay, California.**—*From author's abstract.*

5K–203 551.465

*Bretschneider, Charles L., **Field investigation of wave energy loss of shallow water ocean waves.** *S. Beach Erosion Board, Technical Memorandum*, No. 46, Sept. **1954.** 21 p. 20 refs., 12 figs., s., tables, appends. **DWB**—A summary of the field investigation and wave data obtained on ve energy loss of shallow water ocean waves, carried out during the past two years in the Gulf Mexico. Data were recorded at offshore oil platforms with Woods Hole type I pressure head ve recorders. Data were analyzed for the maximum, significant, and average of the highest percent. From the corresponding values of the significant waves measured, the actual percent uction in wave energy was determined, from which the bottom friction factors were computed. nd wave data (as well as swell) were also recorded at a number of stations in the Gulf of Mexico d analyzed. Upper limit for shallow water wave generation (steady state) over a flat bottom pears to conform to a bottom friction factor of $f = .01$ to .02, in regards to wave energy loss for nd waves generated in shallow water. For wind generated waves in shallow water, it is indicated at the relationship between the maximum wave height and the significant wave height is a function the depth parameter gd/U^2. *Subject Headings:* **1. Shallow water wave theory 2. Ocean wave ght data 3. Gulf of Mexico.**—*From author's introduction.*

5K–204 551.465

Bretschneider, Charles L., **Generation of wind waves over a shallow bottom.** *U. S. Beach osion Board, Technical Memorandum*, No. 51, Oct. **1954.** 24 p. 13 figs., 10 refs., eqs. **DWB**— merical method presented for determining the generation of wind waves over a shallow bottom, ing bottom friction and percolation in the permeable sea bottom into account. The method is entially that of successive approximations were in wave energy is added due to wind stress and otracted due to bottom friction and percolation. This is done by making use of the deep water ecasting relationships developed by SVERDRUP and MUNK and revised by BRETSCHNEIDER for termining the energy added due to wind stress. Wave energy loss due to bottom friction and rcolation is determined from the relationships developed by author and REID. Resultant wave ghts and periods are obtained by combining the above relationships by numerical methods. *bject Headings:* **1. Ocean wave generation 2. Shallow water wave theory 3. Wind stress Wind-wave energy transfer.**—*From author's abstract.*

5K–205 551.556:532.59:533.607

Francis, J. R. D., **Wave motions and the aerodynamic drag on a free oil surface.** *Philosophical agazine*, Ser. 7, 45(366):695–702, July **1954.** 5 figs., table, 6 refs. **DWB**—Air was blown over cous oil in a wind tunnel. At low air speeds there were no waves on oil surface. At 967 cm/s 8 cm above surface (estimated as 500–560 cm/s at 0.05 cm) small ripples appeared, some of which ldenly accelerated and grew rapidly. With increasing wind these developed into a whole train waves like water waves. These phenomena are attributed to the instability predicted by KELVIN a calculated speed of 516 cm/s. *Subject Headings:* **1. Wind waves 2. Kelvin waves 3. Critical nd velocity.**—*C.E.P.B.*

5K–206 551.556:532.59

Walden, Hans, **Eine Dünungsbeobachtung sowie die Beziehungen zum erzeugenden Windfeld.** n observation of swell and its relations to the generating wind field.] *Deutsche Hydrographische itschrift*, 7(1/2):59–62, **1954.** 2 figs., 7 refs. English and French summaries p. 62. **DWB**— Feb. 23, 1952, in 28°N, 20°W, increasing swell from 310° was observed in nearly calm weather. is is attributed to strong W winds on S side of a deepening depression in 45°N, 50°W on Feb. 21. e track, period and height of the swell are calculated. *Subject Headings:* **1. Ocean swell 2. Ocean ve generation.**—*C.E.P.B.*

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Note: The contents of periodicals included in this section are for information only, and will not be listed in the monthly indexes until abstracted. When material is furnished in advance of date of publication, the pagination may be omitted.

American Geophysical Union, Transactions, Volume 35, Number 5, October 1954.

McNish, A. G. and Lincoln, J. V.: **Prediction of the present sunspot cycle,** p. 709–710.
Chernosky, E. J.; Maple, E. and Coon, R. M.: **Rapid geomagnetic fluctuations at Tucso Arizona,** p. 711–721.
Arons, A. B. and Kientzler, C. F.: **Vapor pressure of sea-salt solutions,** p. 722–728.
Neiburger, Morris: **A note on the reflection of diffuse radiation by the sea surface,** p. 729–73
Wilson, Basil W.: **Generation of long-period seiches in Table Bay, Cape Town, by barometr oscillations,** p. 733–746.
Pierson, Willard J., Jr.: **An interpretation of the observable properties of 'sea' waves in ter of the energy spectrum of the Gaussian record,** p. 747–757.
Marks, Wilbur: **The use of a filter to sort out directions in a short-crested Gaussian sea surfa** p. 758–766.
Neumann, J. and Rosenan, N.: **The Black Sea: energy balance and evaporation,** p. 767–774.
Kirkham, Don: **Seepage of artesian and surface water into drain tubes in stratified soil,** p. 77 790.
Reinhart, K. G. and Taylor, R. E.: **Infiltration and available water storage capacity in the s** p. 791–795.
Hendricks, E. L.: **Some notes on the relation of ground-water levels to pond levels in limesto sinks of southwestern Georgia,** p. 796–804.
Li, Wen Hsiung; Bock, Paul and Benton, George S.: **A new formula for flow into partia penetrating wells in aquifers,** p. 805–812.
Aronovici, V. S.: **The application of the ring infiltrometer to diagnosis of irrigation proble in southern California,** p. 813–820.
Donn, William L.: **Direction studies using microseism ground-particle motion,** p. 821–832.

American Meteorological Society, Bulletin, Volume 35, Number 8, October 1954.

Simpson, R. H.: **Structure of an immature hurricane,** p. 335–350.
Wahl, Eberhard W.: **A weather singularity over the U. S. in October,** p. 351–356.
Clem, LeRoy H.; Colson, DeVer and Harrison, Louis P.: **Corrections of upper-level w computations for effect of earth's curvature,** p. 357–362.
Colson, DeVer: **Meteorological problems in forecasting mountain waves,** p. 363–371.
Program of the 133rd National Meeting of the American Meteorological Society, November 19, 1954 at Miami Beach, Florida, p. 381–390.

American Meteorological Society and Royal Meteorological Society, Proceedings of Toronto Meteorological Conference, Sept. 9–15, 1953. London, Royal Meteorolog Society, 1954.

Ozone and the high atmosphere.

Normand, Charles: **Ozone and the upper atmosphere,** p. 4–8.
Crary, A. P., Kennedy, William B. and Bushnell, Vivian C.: **Atmospheric winds and t peratures at heights up to 60 kilometres as determined by acoustical propagation stu** p. 9–13.
Arnold, A. and Brasefield, C. J.: **Atmospheric temperatures at 30 kilometres,** p. 14–16.
Johnson, Francis S.: **Rocket observations of atmospheric ozone,** p. 17–26.
Goody, R. W. and Walshaw, C. D.: **An investigation of the 9·6μ band of ozone in the tell spectrum,** p. 27–30.
Paton, J.: **Direct evidence of vertical motion in the atmosphere at a height of about 80 provided by photographs of noctilucent clouds,** p. 31–33.
Wormell, T. W.: **Winds at ionospheric levels—a survey of recent British work,** p. 33–34.

Radiation and other energy transformations.

Godson, W. L.: **Spectral models and the properties of transmission functions**, p. 35–42.
Kaplan, Lewis D.: **A quasi-statistical approach to the calculation of atmospheric transmission**, p. 43–48.
Walshaw, C. D. and Goody, R. M.: **Absorption by the 9·6μ band of ozone**, p. 49–52.
Plass, Gilbert N.: **Some problems in atmospheric radiation**, p. 53–59.
London, Julius: **The distribution of infra-red cooling in the atmosphere for winter and summer seasons**, p. 60–67.

Arctic Meteorology.

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